THE LONDON NATURALIST

The journal of the
LONDON NATURAL HISTORY SOCIETY

No 69

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LONDON NATURAL HISTORY SOCIETY

The Society welcomes new members, both beginners and experts. Its Area lies within a 20-mile (32 km) radius of St Paul's Cathedral and here most of its activities take place. Although much covered with bricks and mortar, it is an exciting region with an astonishing variety of flora and fauna. The Society comprises sections whose meetings are open to all members without formality. For those interested in arachnology, archaeology, botany, conchology, conservation, ecology, entomology, geology, herpetology, mammalogy, ornithology, palaeontology or rambling, there is a section ready to help.

Publications

The London Naturalist, published annually, contains papers on the natural history and archaeology of the London Area, including records of plants and animals.

The *London Bird Report*, also published annually, contains the bird records for the London Area for each year, as well as papers on various aspects of ornithology.

Bulletins of news items, including the Society's *Newsletter* and the *Ornithological Bulletin*, are sent to members throughout the year.

Indoor meetings

These are held in most weeks throughout the year, with lectures, discussions, colour slides and films on all aspects of natural history.

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The Membership Secretary, P. C. Holland,
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THE LONDON NATURALIST

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Cardamine flexuosa × *pratensis* at Bentley Priory, Middlesex. *Photo: David Bevan.*

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†Deceased March 1990. An obituary appears on p. 147.

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R. M. Burton, B.A., F.L.S.,
Sparepenny Cottage,
Sparepenny Lane,
Eynsford, Kent DA4 0JJ

Bryophytes:
Dr K. J. Adams,
63 Wroths Path,
Baldwins Hill,
Loughton, Essex IG10 1SH

Ecology and Entomology

Mammals:
R. V. Goulding,
239A Carr Road,
Northolt, Middlesex UB5 4RL
081-864 0759

Reptiles and Amphibians:
T. Langton,
12 Millfield Lane,
London N6 6RA
098684 518

Mollusca:
F. C. Naggs,
c/o Department of Zoology,
British Museum (Natural History),
London SW7 5BD

Dragonflies:
S. J. Brooks,
35 Salisbury Avenue,
St Albans,
Hertfordshire AL1 4UB 0727 63532

Fishes:
A. C. Wheeler,
Epping Forest Conservation Centre,
High Beach, Loughton,
Essex IG10 4AF.

Butterflies, moths, invertebrates not listed elsewhere:
C. W. Plant, B.SC., M.B.O.U., F.R.E.S.
14 West Road,
Bishop's Stortford,
Hertfordshire CM23 3QP
0279 507697

Spiders and other arachnids:
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80 Weston Park,
London N8 9TB
081-341 2158

Orthoptera:
D. Martin,
121 Devonshire Road,
Hornchurch,
Essex RM12 4LP

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143 Westleigh Avenue,
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134 Station Road,
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18 Edwick Court,
High Street,
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10 Ellice Road,
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36 Rye Road,
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Surrey and Upper Thames: (Staines to Wandsworth)
P. G. W. Salaman,
28 Oakway,
London SW20 9JE

Middlesex:
P. Naylor,
27 West Common Road,
Uxbridge,
Middlesex UB8 1NZ

Geology

Mrs D. J. Goulding,
239A Carr Road,
Northolt, Middlesex UB5 4RL

*Records may be sent to the appropriate recorder or to Colin Plant who will distribute to each recorder the relevant data from a mixed set of records.

Requests for information should be made to the appropriate recorder.

Contents

Report of the Society for 1989*

The Society has enjoyed another active and productive year in the field, well supplemented by a varied programme of meetings indoors. Membership seems not to have been seriously affected by last year's subscription increase. There was a limited response to a notice early in the year advertising the Society on Channel 4 *Teletext,* but an advertisement in *Floodlight* has already produced some new members.

There has been every opportunity for members to develop their skills and perception in the field, both individually and working together. For the ornithologists, individual effort continues to find topical expression in the pages of the *Ornithological Bulletin,* a carefully compiled two-monthly account of the remarkable diversity of bird life in London and its immediate surroundings. The definitive annual record, the *London Bird Report,* is the work of many hands and is a distillation of reports from about 500 contributors. The production of No. 53 for 1988 has progressed slower than usual under its new Editor, but should appear early in the new year. Field work for the London Breeding Bird Atlas continued throughout the spring and summer with effort being concentrated on areas not covered in 1988. This appears to have been fairly successful though some of the more central areas still need quite a lot of attention. An active programme of field and indoor meetings, included bird ringing at the reservoirs, coach trips to special ornithological sites and illustrated talks on a variety of both specialised and general interest topics.

None of the other sections of the Society is able to command the numerical superiority of the ornithologists, but in the Botany Section there is unfailing support each year for a varied and well-conducted programme in the field. Informal indoor meetings for the study of, and instruction in, particularly complicated groups have now become a regular feature and the annual showing of all the best botanical slides taken by members is always a memorable event. A number of well-known speakers, themselves excellent photographers, contributed to an indoor programme appreciated both for its botanical content and the beauty of its illustrations. The strength of Botany in the Society has always been evidenced by the regular publication of results and observations. In recent years, and particularly in 1989, the section has reported its field meetings, often in welcome detail, in the pages of the new-look L.N.H.S. *Newsletter.*

The *Newsletter* has now been running for 17 years and No. 93, which appeared in February 1989, was the first in the series to be accorded ISSN recognition. It is a pleasure to look forward each alternate month to reports from the sections of their most recent field and indoor meetings.

The Ramblers and Archaeology Section continues to provide a highly diverse programme of meetings, both indoors and in the field, the latter varying from guided visits to notable sites of archaeological interest to leisurely, out-of-town rambles for the general enjoyment of the countryside. More additional weekday field meetings were organised this year and were well supported. Both general and specialist interests have been most ably catered for at the regular indoor meetings.

Our South-West Middlesex Section, which holds its well-attended indoor meetings on a variety of natural history topics at Heston, continues to provide a focal point of interest for members living to the west of London. Its field meetings take full advantage of the many worthwhile sites which lie easily within reach, while this year's varied programme of indoor meetings included a buffet and quiz. The Geology Section provides regular and comfortable long-haul transport by coach to geological exposures both inland and on the coast. From

*Presented at the Annual General Meeting, 12 December 1989.

the frequent *Newsletter* reports it is evident that the party is usually successful in finding — and identifying — fossil remains in variety. There has also been a notable programme of illustrated lectures by specialists in all manner of geological and palaeontological subjects, besides informal meetings and visits to famous collections.

The Society's long-running ecological survey on The National Trust common at Bookham continues and, by general consent, in January 1989 again became part of the Ecology and Entomology Section after operating for a number of years as a working party of Council. The Society has erected a new survey hut at the common which has the benefit of electric lighting and heating, furniture, and books. Its facilities are available to all members and all sections on the advertised dates and, by prior arrangement, at other times.

Elsewhere in the Home Counties, the Ecology and Entomology Section held 17 field meetings during the year. The section's time-honoured policy of providing meetings for the widest spectrum of interests, including minority interests, perhaps inevitably leads to some unevenness of attendance. But sufficient members take advantage of these opportunities to sample exciting new aspects of natural history for the policy to be justified. In addition the section is active in biological recording and promotes the recording in the London Area of six major groups of invertebrates and all vertebrates except birds. Such studies have led to important papers on London's spiders, dragonflies, butterflies and moths this year in *The London Naturalist* and *The London Atalanta.*

The Ecology and Entomology Section's newsletter, *The London Atalanta,* was launched in 1987 to provide, *inter alia,* the means of recording a selection of the section's field and indoor meetings in greater depth than would otherwise be possible. Six issues have appeared this year and speakers have in the main been very prompt and helpful in providing transcripts of their lectures.

It is with regret that we record the deaths of the following members: Miss Betty Crawfurd, a member since 1962, Dr A. M. Easton, C. J. Frost and Mrs J. M. Short; and a former member, Miss E. M. Goom. Dr Easton joined in 1944 and made a valuable contribution to the Bookham Common Survey; Jean Short joined in 1972 and was the Publications Sales Secretary, in which role she succeeded in placing the Society's journals in an increasing number of retail outlets: Margaret Goom joined in 1939 and for many years provided notable service to the Society on the Ornithology and South-West Middlesex Committees and as a member of Council.

Our thanks go to all officers and sectional committees who work so hard for the Society. Thanks also go to Imperial College for allowing us the use of their rooms and to Mrs Czigany and her staff for the custody of the Society's library.

Society Grants

The Society sets aside a small amount each year to assist conservation work, the establishment or maintenance of nature reserves and scientific investigation in the London Area. Applications for grants and loans are considered by the Administration and Finance Committee: enquiries should be addressed to its Secretary. Papers reporting results of research supported in this way must be submitted for publication in the Society's journals.

Book Review

Birds by Character. The Fieldguide to Jizz Identification. By Rob Hume. Illustrated by Ian Wallace, Darren Rees, John Busby and Peter Partington. Macmillan (Papermac), London, 1990. 176 pp. Profusely illustrated throughout in colour (including distribution maps) and black and white. £12.95 in hardback. £7.99 in paperback, ISBN 0 333 49054 1.

One never ceases to wonder at the number of bird books that appear year in, year out. When 'Peterson' was undergoing gestation we were awaiting an event that did much to revolutionize British field ornithology. A lecture to the L.N.H.S. on warbler identification by Guy Mountfort, one of the authors, shortly before the book's appearance in January 1954, did much to whet our appetites. We were introduced to the art of looking *for* and *at* specific characters *in the field.* We had left behind the days of needing to produce the corpse to satisfy the equivalent later of the 'Ten Rare Men'.

Field identification progressed and birdwatchers gave 'small brown jobs' a second, and third, look — in detail. Copious field notes were made and one of the chief proponents of this discipline was Ian Wallace, an erstwhile active member of our Society and one of the artists of the present book — who also lectured to us on field identification on more than one occasion.

The word 'jizz' appeared in our vocabulary and although we all knew what it meant, it wasn't easy to define. However, as we enlarge our experience, so our appreciation of jizz increases. Flight, across open spaces or from tree to tree; feeding habits, on the ground, in or from the trees or in herbaceous vegetation; swimming and diving techniques; perching attitudes; song-flights and postures; escape attitudes, all these add up to one's own interpretation of jizz.

I recommend you to take this book into the field and see for yourself how precisely the habits of the birds you are looking at copy the features illustrated. It really is good. I expect you will know of other characters to add to some species. No book is ever complete, and a first edition always creates interest and draws attention to omissions. It is well known that as you learn more about a topic, you realize how much more there is still to learn.

I noticed a mis-spelling in the Latin name of the brambling, and the word 'rhododendrum' was new to me. Four species have their Latin names missing — see pages 50, 110 and 134 (2) — and the explanations of the cross references on page 16 give *PHM* for *P*eterson, *M*ountfort and *H*ollom. The distribution maps for the wren and the mute swan show them to be summer visitors to the British Isles and not residents, whilst the house martin does not even occur in our islands! The chapter 'Using this book' states that vagrants are indicated by a brown arrow and that passage migrants have the words 'spring/ autumn' included. Some do, but the reader could assume that species like red-footed (red-fronted in the Index) falcon, alpine swift, red-rumped swallow and rustic bunting, to name a few, don't occur in the British Isles.

The publishers claim on the front cover that this is 'The most important new fieldguide for decades'. They may well be right. To sum up in the authors' own words, 'The book will widen your horizons and increase your enjoyment of birds, which are so essentially full of life and action'.

K. H. Hyatt

The Young Person's Guide to the L.N.H.S. — a First Hundred References

by C. B. Ashby

(Presidential Address delivered at the Annual General Meeting on 12 December 1989)

'There is much to be said for developing wider interests, especially at the level of the informed amateur, and it is in sustaining a climate in which such general studies may prosper that the L.N.H.S. provides one of its most valuable services to members.'

That is an extract from something I wrote in the *Newsletter* at the beginning of this year. At the time, I believed it to be true; I still do. After I had written it, I fell to thinking to what degree could so sweeping a statement be justified and defined in more precise terms. This has been the first opportunity for me to share with you my thoughts on this, and afterwards you will be free to judge whether I was right.

If we are to take a look at the past achievements and present activities of the Society, what are to be the sources of our information? The Society's four books, of course; *The London Naturalist* and the *London Bird Report;* also the *Newsletter,* the *Ornithological Bulletin, The London Atalanta,* the half-yearly programme booklets, even such archive material as the Minutes of Council and the Committees. There is no shortage of source material. What is less certain is whether I can distil the essence of so much into a short Address and yet preserve a thread of continuity and message.

Who would benefit from such an exercise? I suggest that every member who would like to be more aware of the truly vast accumulation of knowledge for which the Society has been, and continues to be, responsible would benefit. All who would like to associate themselves more closely with this collective endeavour would benefit. Those who particularly stand to benefit from a better awareness of the Society's achievements are our newer members, those who have not yet had time to assimilate more than a fraction of the whole. Because the population of London is ever changing, and perhaps for other reasons, we enrol between 100 and 150 new members every year. But, sad to say, an almost equal number either resign or do not renew their subscriptions, so that our membership is fairly static at about 1,200. This is a good figure for a local society; I can think of more than one national society which would be pleased to have this level of support. Other organisations in the region have developed and won popular acclaim, and must present many discerning local naturalists with a choice of allegiance. If I can reach that proportion, hopefully a small proportion, of our members who may drift away after only the briefest acquaintance with us, not fully understanding the part they could play, it must surely be to advantage.

An account of the physical setting of the London Area was given by R. S. R. Fitter in the first of the Society's books, in 1957.[1] Other contributors in other chapters enlarged on the special characteristics of the main habitats. The theme was taken up twenty years later by David Montier, in the *Atlas of Breeding Birds*,[2] with valuable comments on the underlying geology in relation to the main habitats. Both these works saw the configuration and utilisation of the land in terms of habitats determining the status and distribution of birds. To read the corresponding pages in Colin Plant's recent book on the butterflies[3] is to see these varied habitats through the eyes of an entomologist, and to lament with him that much of the 161 hectares of predominantly coniferised woodland surveyed in the London boroughs by the G.L.C. Ecology Unit in 1984 'lies on former ancient semi-natural woodland sites, or on sites which were once

important grasslands'. Another entomological assessment of the London Area habitats is presented by Eric Groves in Part 16 of his monumental series of publications on the Hemiptera-Heteroptera of the London Area.[4] Groves recognises and deseribes 16 distinct types of habitat whieh go to make up the London Area. Naturalists of all persuasions will find this of value, especially as it is given in such detail as to form a gazetteer. Keith Betton, in his Address to the Society in December 1983,[5] identified and describcd 34 Sites of Special Scientific Interest (S.S.S.I.s) in London under the headings woodland, heathland and scrub, grassland and downland, geological sites and wetland areas. My predecessor, Michael Wilsdon, in his second Presidential Address,[6] focused our attention on significant parts of our Area under threat, partieularly the remaining grazing marshes along the Thames, all of whieh at the eurrent rate of progress may have disappeared by the year 2002.

There is no shortage of assessments in our publications of habitats within the built-up inner zone: for example, W. G. Teagle, in his account of the site on which now stands the New Covent Garden Market at Nine Elms, Battersea,[7] described it as a vast wilderness in a totally urban setting, in which the vegetation had been allowed to run riot for fifteen years. 'No London naturalist of my gencration', wrote Teagle, 'can look upon a large expanse of urban dereliction without being reminded of the City bombed sites'. Perhaps not too many members have on their shelves the post-war volumes of *The London Naturalist,* and will enjoy a visit to the library to read successive accounts by F. E. Wrighton, A. W. Jones and others between 1947 and 1957 of the devcloping flora and fauna and, of course, the 'temporary geological exposures' of Finsbury and Cripplegate; where the air-raids of 1940 and 1941 had left 'but few buildings standing, only fast-crumbling walls of brick and mortar'.[8,9] E. W. Groves, writing in March 1959,[10] when rebuilding was well under way, provided a summary of the previous studies, and contributed an aecount of the invertebrates in an ecological essay whieh stands as a model of its kind.

Valuable contributions to the Society's publications, and indeed to the corporate life of the Society throughout its history, have been made by the very able botanical element of our membership. An early general survey of all the main habitats of the London Area from the botanical standpoint was made by J. H. G. Peterken in 1952.[11] From 1951 to 1957 *A Hand-list of the Plants* appeared as supplements to the *L.N.*, and despite its covering all the flowering plants, ferns and stoneworts its authors, D. H. Kent and J. E. Lousley, modestly disclaimed the appellation of a 'Flora' for the results of their labours, which ran to 368 pages.[12] No such reservations were needed 26 years later, when Rodney Burton in 1983 brought out the highly-acclaimed *Flora of the London Area*,[13] covering some 2,000 species in a work of notable scholarship and appeal. A few copies of this landmark in L.N.H.S. publishing are still available for sale at modest cost; news which I have no doubt will be joyfully received by members who have reeently joined.

From the same author we see each year in the *L.N.* a seleetion of the most noteworthy plant records for the London Area. On reading these we are moved to congratulate our botanists for their skill and fieldcraft in discovering species and hybrids which are either scarce or new; and to commiserate with them when we read that a colony of the much-prized bee orchid reported in 1985 from a former railway property near Herne Hill came to a sudden end; 'the site was bulldozed later that year by its owner, who was concerned that attention being paid to the wildlife value of the site would scotch his plans to build on it'. I am happy to report that his hopes were dashed.[14] The summary for 1987[15] includes one of the few reports in our publications of the effects of the great storm on the night of October 15th/16th, when mostly mature trees were broken and uprooted in all the London counties. A statistical account of the damage sustained by the Royal Parks, in which nearly 4,000 trees were lost, appeared in *The London Atalanta* in September 1988.[16] Our recorders would be pleased to

receive from members their observations of the developing effects on the flora and fauna of the Area as they become apparent in the years following the storm.

Papers on many topics of botanical interest appear regularly in the *L.N.*, and although I cannot for the moment refer to them in any degree of detail that would do them justice I will mention just two. 'Living in Central London', wrote Rosalind Hadden in 1978, 'I used to think that my botanical interests must be confined to the occasional trip to the country'. 'This paper', she continued, 'is the record of my discovery that I was wrong'. There followed an account of 157 species located in the W.1 postal district, centred on Oxford Street, heavily built up and excluding the central parks.[17] *The Flora of Totteridge and its Neighbourhood,* by Dr Diana Griffith, appeared in 1986.[18] This is another excellent example of a local survey, and deals with 378 species of vascular plants in relation to their habitats and distribution in an area of increasing urbanisation.

The relationship between the vegetation of the London Area and such environmental factors as soil, topography and human interference since the last glaciation was outlined by Dr Francis Rose in 1957.[19] The climate, vegetation and animal life of prehistoric London were further discussed with great authority by C. P. Castell in his two Presidential Addresses in 1957 and 1958. The transcripts which appeared in the *L.N.*[20,21] rank among the most important contributions to the subject in London ever to have been presented, and are essential reading. Samuel Pepys, as it was revealed, was no mean geologist, and a fascinating extract from his *Diary* gives a glimpse of the vegetation of the Thames marshes in Post-Glacial times. Castell's account of the fauna of the warm interglacials, from the prolific evidence of the Taplow and Boyn Hill Terraces, included the fox, roe-deer, greylag goose and many others living in and about London today. But this was not all: 'towards the end of the last glaciation, mammoth, woolly rhinoceros, reindeer and lemming were still living in the Lea valley'.

Geologists and palaeontologists in London need to be ever on the look-out for opportunities presented by public works and other temporary holes in the ground; and in this connection I must admit to having been disappointed that nothing significant seems to have come from the countless quite deep craters which appeared overnight when giant trees were levered from their beds by the storm of October 1987.[22] For a fine example of opportunist geological research I must refer you to the long list of no less than 54 species of interglacial fossils recovered by hand picking from a heap of excavated sediment at Upminster, Essex, published by G. R. Ward in 1984.[23] Bivalve and gastropod molluscs predominated, but plants, Foraminifera, arthropods and fish were also found and identified.

Other papers on the London fossil record which have appeared since the invaluable 20-year *Index* by Burton and Hillman[24] have been by Cooper,[25] Hackett,[26] Roberts and Roberts[27] and Preece and Robinson.[28] I trust their authors will forgive me if I now refrain from detailed comment, but all are notable and well worth reading. Lists of fossil birds from the Pleistocene, mostly of species still occurring in the London Area, but including a red-breasted goose from Grays, Essex, a white-tailed sea eagle from Walthamstow and an eagle owl from Swanscombe, were confirmed by Harrison and Walker in 1977[29] and by Harrison in 1979.[30] If I am to refer you to a classic paper of an earlier period, it must surely be that by our Vice-President, R. E. Butler in 1969,[31], entitled *Looking into the Past.* 'To study the present in any field of Natural History', wrote Butler, 'may seem a full enough task, but it remains incomplete without some knowledge of evolution.'

All manner of primitive, often tiny, but essentially successful, life forms abound in every habitat. A group having at least two of these attributes is that

of the Myxomycetes, known to some as the Mycetozoa and to others as the slime moulds. The basic sources of reference for the London Area are the 1965 Hand List by Bruce Ing,[32] and the valuable paper by J. Ross on the Mycetozoa of Epping Forest.[33] Possessed at different times of their life cycle of both mobility and the capacity to produce fruiting bodies or sporangia, these ancient organisms are of world-wide distribution. Two examples of *Craterium concinnum* Rex, new to Britain and only the third and fourth records for Europe, were discovered in Epping Forest and in Mad Bess Wood, Ruislip, by Peter Holland and Miss Margaret Holden in 1968.[34] Fungi proper, if I may use the term, are popular items of study by field naturalists, in contrast to their smaller relatives, the yeasts, rusts and mildews, still the preserve of specialists. An important paper on the Fungi of Epping Forest by C. W. Plant and G. Kibby[35] records the results of a survey in the southern part made between 1979 and 1983, and includes a valuable set of references.

Students of the lichens of London were well served by J. R. Laundon in 1970,[36] when the major part of the *L.N.* for that year was devoted to a statement of the known lichen flora, then standing at 165 species, and a discussion of the deleterious effect which atmospheric pollution has had, and continues to have, on the survival of these 'dual plants' which, in the words of Professor J. Arthur Thomson, provide the most remarkable instance of symbiosis, or living together, in the whole of the plant kingdom. The first systematic list of the bryophytes — the mosses and liverworts — to be published by the Society was by J. H. G. Peterken and appeared in 1961.[37] Of many subsequent accounts, I will mention just one: *The Bryophyte Flora of Bookham Common,* by R. C. Stern and O. B. J. French,[38] which listed all the hepatics and mosses recorded during the nine years to 1981, and compared their distribution, habitat and abundance with previous periods. Algae, being more simply organised than the mosses, should perhaps have been treated earlier in my review; so that I must hasten to remind you of Dr B. A. Whitton's two papers on variations and seasonal changes in the phytoplankton, consisting of diatoms and other micro-algae, of St James's Park lake.[39,40]

Plant galls, those hard or corky growths and lesions on leaves, fruits and stems, are caused by a great variety of agents. Bacteria account for a few, fungi and nematodes for a few more; but the majority represent an essential part of the life-cycle of a great host of tiny arthropods, which may be arachnids or insects of several orders. It is all too easy to pass them by as being 'beyond our ken'; but down the years the L.N.H.S. has always enjoyed the advantage of having specialists among its members who have been able and willing to carry on the long tradition of the study of these formations. For a recent statement of the special part the L.N.H.S. has played in their evaluation I need do no more than refer you to the scholarly paper by Melanie Hollins and Colin Plant in the *L.N.* for 1987.[41] This also provides a welcome bonus in touching on the history of the Society itself, and gives useful pointers to the sources by which you may learn so much of the past and, in so doing, enrich the present.

The gall-dwellers are by no means the only cryptozoic animals of ancient pedigree to share our every habitat. Life and death struggles are unremittingly being conducted unseen and unheard on every side, beneath our feet, in all the secluded byways of the soil and vegetation, by creatures of whose presence one may so easily be totally unaware; or, if aware, dismissive. Dr Adrian Rundle, well known to readers of the *L.N.* for his work on the fossils to be found at various sites in the London Clay,[42,43] is versed also in the tiny, living creatures of the soil. As small mammals are to the vertebrate food chain, so the 300 species of springtails are to hosts of carnivorous mites, spiders, ground beetles, pseudoscorpions and centipedes. One of the most original and memorable field meetings the Society has enjoyed in recent years was that led by Dr Rundle in the spring of 1987, when many of these retiring creatures were discovered and explained.[44]

Much progress has been made by our Recorder for spiders, Edward Milner, in bringing up to date and greatly expanding our knowledge of the spiders of the County of London, the total for which at the end of 1987 stood at 224 species, 36 of which were recorded for the first time in the course of Mr Milner's paper in the *L.N.* for 1986.[45] Beyond the old county boundary, adhered to for spider recording for the sake of continuity, at least a further ten species may be added within the Society's recording area. Many are money spiders, those far-ranging aeronauts we encounter on their parachutes of silken threads, and at least a lens, if not a microscope, is needed for their identification. The fame of one of Mr Milner's larger captures, *Micrommata virescens*, rediscovered in Oxleas Wood after an absence of 250 years, reached even the popular press and was featured, with illustrations, in one of our *Newsletters*.[46] A list of 68 species resulting from five visits to Bostall Heath is given in the October 1989 issue of *The London Atalanta*,[47] and includes seven further new species for the County of London.

Entomology has been an abiding interest in the Society since the earliest days of the City of London Entomological Society in 1858, but our practice of it is changing. I would be surprised if more than a tiny proportion of the two pages of contributors to Colin Plant's recent butterfly book[3] have collected British butterflies in the last ten years. The Society's future role in species distribution recording and in total site recording was discussed by the same author in his review of the subject in 1986.[48] The advent of the mercury-vapour light trap for nocturnal insects, notably moths, has provided a back garden activity for a generation of lepidopterists. Their records have been collated and presented in the series of papers in the *L.N.* by the Baron de Worms from 1953 to 1958, followed by his nine reviews between 1960 and 1977; and thereafter by Colin Plant who has continued the tradition of biennial reviews in the *L.N.*, and has extended their scope to include the Microlepidoptera, the London list for which now exceeds 640 species.[49,50]

Of these, the nepticule moths are a family of leaf-miners whose larvae dwell within the leaves of a variety of trees and shrubs. The feeding chambers, or 'mines', formed by their daily progress within the leaf, conform to a pattern with characteristics of such constancy as to betray the identity of the miner. In another group, the Coleophoridae, the larvae contrive portable habitations, known as 'cases', either from silk or from tiny fragments of leaves woven together. The distinctive form and composition of these cases provide clues to their identification, and the Society has of late sought to regenerate the former keen interest in these groups by arranging field meetings under experienced leaders.[51,52] For the last eleven years our member and frequent field meeting leader, Ray Softly, has been studying the micro-moths of Hampstead Heath, and has run an actinic light trap on his balcony overlooking the heath on almost every night.[53]

Damselflies and dragonflies when dried as specimens tend to lose much of the beauty and colour which they have in life, and today provide trophies more for the photographer than the collector. Photography now plays an increasingly important part in entomology, but to put it into some kind of perspective we would do well to read the Minutes, written in the neat, sloping hand of Leonard Parmenter, of the Entomological Section's A.G.M. on 2 November 1954; which relate that Mr E. E. Symes F.R.E.S. exhibited photographs of the *eggs* of no less than 75 species, drawn from the Odonata and twelve other orders of insects.[54]

Ruth Day's mark, release and recapture technique for evaluating the populations of damselflies at Bookham involved her in almost daily visits to the ponds in the summers of 1985 and 1986, winter visits for larvae, and yet further visits in 1987.[55,56,57] This study, and the three-year survey of the butterflies of London's East End undertaken by David Murdoch, Terry Lyle and M. J. Holmes between 1984 and 1986,[58] are excellent examples of that which can be

achieved given the ability to identify and carry through a personal programme of research.

Comprehensive recording of the dragonflies and damselflies of the London Area has been promoted by our recorder for the Odonata, Stephen Brooks, whose interim publications on the status and distribution of this group have led to his review in the latest issue of the *L.N.*[59,60] The last general statement of the kind was by our Honorary Vice-President, Cynthia Longfield in 1949,[61] and it is instructive to learn what has been happening since. The 25 species of grasshoppers, crickets and allied insects recorded in the Area were reviewed by R. M. Payne in 1958,[62] and the bush-crickets of Thamesmead were described by Patrick English in 1986.[63] Apart from individual records of infrequent species, very little seems to have been published in the last three decades. To David Martin has been entrusted the responsibility for reviving interest in this very attractive group of insects and we wish him well.

A group which once figured very prominently in our affairs was the Diptera, due largely to the influence of Leonard Parmenter[64] and Edwin Nye.[65] This immense order of two-winged flies, embracing literally thousands of species, includes the hoverflies, many of which are reasonably easy to identify and all of which pay dividends in the form of interest and enjoyment to anyone willing to take more than a passing look. For a working list of the hoverflies of the London Area, may I refer you to Colin Plant's modern compilation of 148 species in the *L.N.* for 1985.[66] The practice of showing entomological exhibits of interest at our indoor meetings is one which I think we would do well to revive; although I hardly expect to see a return to the method of our Victorian forbears, who passed around their exhibits pinned to the cork lining inside their top hats.

The indictment of Britain by Brussels for allegedly not meeting E.E.C. standards of water purity, and the recent privatisation of water supplies, has refocused popular attention on such matters as the run-off of farm chemicals and other sources of pollution. The quality of water in the freshwater rivers of the Thames drainage area is now regularly checked, not only by chemists but by biologists; who have come to realise that the unceasing monitoring of the water *by the biotope* ensures that even transient sources of pollution are unlikely to escape detection. Very broadly, the system is based on knowing which of the many invertebrates living in rivers will not tolerate pollution. If these prosper at any given sampling point, you may be sure you have pure water. The method was most ably demonstrated to the Society earlier this year by Dr Derek Tinsley, of Thames Water, and you can read about it in No. 14 of *The London Atalanta*.[67]

How long, we may wonder, is required for a river to recover should it suffer serious pollution as, for example, a discharge of toxic material by accident or negligence? In April 1985 some 500 litres of insecticide were spilled into the River Roding in Essex, polluting 20 km of the river and killing 90% of the fish. An investigation by P. J. Raven[68] concluded that, with a few minor exceptions, the animal and plant life of the river was restored to its pre-spillage status in little more than two years.

As you would expect, there are many references to the Thames and its tributaries in our publications. The essential theme running through all of these is its purity — or lack of it. Such epithets as 'the murky Thames' appear in earlier contributions, but in the last twenty-five years, as members have been able to see for themselves, fish and invertebrates have returned to reaches that formerly were lifeless.[69] A comprehensive account of the macrofauna of the Thames estuary, by Andrews, Aston, Rickard and Steel, was published in the *L.N.* for 1981; lists of the arthropods, coelenterates and other invertebrate groups are followed by detailed records and status summaries of some seventy species of fishes taken in the much improved waters of the estuary.[70] The most

recent of the Society's three field meetings to West Thurrock, the site of much of the research, was made in November, 1987. At the time of our visit the power station was drawing five million gallons an hour from a flooding tide, and although well below the peak rate this was sufficient to bring in a good assortment of fishes to the filter screens.[71]

The situation upstream is equally encouraging. In 1979, and for the next three years, Thames Water released up to 50,000 salmon parr each year into selected pure water nursery tributaries, and salmon smolts were released into the Thames near Sunbury. Thus began a 17-year programme for re-establishing, after an absence of more than a century, a Thames population of the Atlantic salmon.[72] In subsequent years evidence began to build up that smolts were successfully migrating through the estuary, and that salmon up to two or even five kg in weight were being recovered at such stations on the Thames as Molesey and Shepperton, and on the Rivers Wey and Mole.

From fish to other lowly vertebrates is but a short step. The Society has not published details of the status and distribution of amphibians and reptiles since Peter King's summaries for the years 1978 to 1982.[73] Precise locations of such sensitive species as the great-crested newt are perhaps not suitable subjects for publication, but confidential records are available to *bona fide* enquirers.

And so we come, at last, to the birds. Without doubt, this is where the interest of the major part of our membership resides, and I trust that I shall not disappoint the ornithologists too much if my remarks on this subject are restrained. They, more than anyone, appreciate that for me to do more would ensure that we all miss the last train home. Happily, the situation is made easier by the knowledge that, for the most part, the ornithological information is readily accessible; nearly all of it is stored in the 53 issues of the *London Bird Report,* not one issue of which should be absent from the shelves of anyone who watches birds in the south-east of England. The 50th Anniversary Issue, that for 1985, distinguished itself by mis-spelling the name of its illustrious founder — Richard Constantine Homes — not once, but twice; and also for providing a most valuable list, compiled by the late F. H. Jones, of all the many papers published in the first 50 issues. More recently, the review by A. V. Moon in 1986 of major changes in the status of 43 key species of birds over the last 50 years[74] is a classic example of analysis and reporting. This paper, the three papers by M. K. Dennis on the wintering birds,[75,76,77] and that by K. H. Palmer on the breeding birds of major woodlands,[78] together provide a modern synthesis remarkable for its authority and perception.

The importance of the famous lake in St James's Park as a refuge for wild waterfowl was fully discussed by P. J. Oliver in 1987.[79] Many of the hundreds of tufted ducks, for example, which share the sandwiches of the lunchtime throngs, will have come from far-away breeding grounds in Russia and Scandinavia to spend the winter in central London. Among the most comprehensive studies of an individual species is that by P. J. Strangeman in 1988[80] on the cormorant, now common and widespread in the London Area, and with at least one successful breeding record to its credit. All these valuable papers have resulted in part from personal observation and expert analysis; but all have also been an expression of the efforts of observers and survey teams essentially motivated by a spirit of collective endeavour within the Society.

A small service to the ornithologists will perhaps be provided if I draw their attention to the more recent bird papers which appeared, not in the *L.B.R.*, but in the *L.N.* Evelyn P. Brown's second Presidential Address, entitled *Conserving and Recording Birds in London,* is to be found in *L.N.* No. 52,[81] an issue which also includes some important amendments to a previous account of the birds of the Brent Reservoir.[82] No. 53 has a paper on the birds of Perivale Wood by K. A. Roberts and P. T. Edwards;[83] followed in No. 59 by a paper by P. J. Belman on blue tits and great tits at Perivale Wood.[84] No. 61 has a

paper by Dr Geoffrey Beven on the food of tawny owls in London;[85] and No. 67 has a paper by Dr Colin J. O. Harrison entitled *Group Feeding by Suburban Birds.*[86] A further, and much greater, service to the ornithologists is provided every other month by the *Ornithological Bulletin,* now expanded under the editorship of Keith Betton, and a truly remarkable publication by any standards. For example, No. 186, recently issued, distils the reports of over fifty observers into a highly topical account of the most significant 117 species of birds — including eighteen rarities which would do credit to a coastal observation station — present in the London Area this autumn.[87]

Everyone knows that urban foxes in London, as elsewhere, have found for themselves a new habitat. Supplementing their diet by raiding dustbins and other sources of human food, and secure for the most part from the keeper's gun and the poultry-owner's wrath, they turn up in gardens and along railway tracks; even in brightly lit streets in the small hours — or indeed at any time after dusk if the weather is hard. In Jeremy Cotton's 1981 list[88] the fox shares with the hedgehog the second highest number of sightings, outnumbered only by the grey squirrel. Their often nocturnal habits and retiring ways ensure that mammals generally remain under-recorded in terms of distribution and status, but such information as we have shows that even the dormouse may be found. Without doubt the most determined, and successful, attempt to discover a great deal about a particular group of mammals was the research into bats conducted by Simon Mickleburgh and the participants in the London Bat Project.[89,90] Whether you accept or oppose the concept that L.N.H.S. resources should be applied to the funding of an external project such as this, I think you will agree that the remarkable results achieved could not have come by any other route. I am thankful, however, that we were not left to meet the full costs of this ambitious exercise.

In contrast, the continuous and truly phenomenal biological and ecological survey which members of the L.N.H.S. have conducted at Bookham for no less than 48 years has not cost a penny for professional assistance. It is without doubt the pinnacle of home-spun endeavour and has been noticed far beyond our boundaries. If I have a regret it is that no edited and collected account in book form has yet been possible. The carefully researched surveys of the geology, vegetation, invertebrates and vertebrates, so ably presented in every number of *The London Naturalist,* are an unimpeachable source of reference which one day, I hope, will be the basis of the book we all want to read.

The run of L.N.H.S. publications occupies rather more than a yard of shelf space in my modest library. Enough of value has of necessity been omitted from my review to ensure that you will not be denied the pleasure of discovering a great deal of buried treasure for yourselves. The acquisition by members of back numbers is easier now than ever before, because the Society has recently been advised of the availability of a great store of issues, the existence of which previously was not known to us. Orders for sets and back numbers even as early as 1916 may be sent to the addresses given on the inside front cover of No. 68 of *The London Naturalist.*

Two papers which are too good to miss are the Presidential Addresses of 1973 and 1974 by Keith Hyatt.[91,92] Drawing on his special knowledge of the design, development, organisation and collections of the Natural History Museum at South Kensington, and including the product of a great deal of original and painstaking research, Mr Hyatt has provided us with a treasurable insight into our favourite institution. Other papers which might well come your way from the newly discovered stock include Professor Greenwood's *The Debt of Natural Knowledge to the Amateur*[93] and, on a similar theme, *The Role of the Amateur Naturalist* by Capt. Cyril Diver.[94] The other side of the coin is presented by Rodney Burton's Presidential Address in 1982 on *The Function of a Local Natural History Society.*[95] Michael Wilsdon's closely reasoned consideration of the current state of natural history societies in his Presidential Address

of December, 1987 is equally indispensable.[96] I will leave almost the last word to P. W. E. Currie in his memorable Editorial to *The London Naturalist* for 1950: 'Naturalists come and go, but the Society goes on, if not for ever, at least for considerably more than the normal span of human life. The days are past when one man could take all knowledge for his realm; but in our Society there are specialists in many branches who can produce the answers which the individual would seek in vain'.[97]

The 1892–1914 *Index* by Colin Plant[98] is a valuable source of reference, but our present need is for a new post-1972 Index to the Society's publications to bring us up to date. Burton and Hillman, in the introduction to their 1953–1972 Index,[24] told how a member, C. F. Sayers, had prepared — for his own purposes — an index in continuance of the earlier one compiled by R. S. R. Fitter.[99] If there is among us today a successor to Mr Sayers, someone who has been keeping up a personal index since 1972, I beseech him — or her — to come forward to receive the thanks of us all.

This evening's Address having been billed without a title, your attendance is an act of faith for which I am grateful. If it is to appear, as is our custom, in next year's *L.N.*, the Editor will surely ask me to provide a title. I think I shall ask him to call it 'The Young Person's Guide to the L.N.H.S.' For me to borrow a title of infinitely greater fame and stature[100] is not to plagiarize, but to pay homage to, one of England's most famous sons. In that wonderful piece, which so many of us learned to love at an early age, and have continued to appreciate ever since, each component is given its individual consideration and all come together at the end. Such a plan I have this evening attempted to follow, and I think we have seen that all the disciplines which we embrace can be combined to give credence to our ecological studies ... Did I say it is to be called the *young* person's guide? Surely, we are all young at heart.

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Book Review

Wading Birds of the World. By Eric and Richard Soothill. Blandford Press, London. 1989. 334pp. £10.95. ISBN 0 7137 2130 8 (paperback).

This is an unaltered reissue in paperback of a book first published in hardback in 1982 at £14.95. It opens with a short introduction which does little more than outline the groups covered. The authors, Eric and son Richard Soothill, take 'wading birds' to include virtually all of the waders or shorebirds (excluding only the jacanas, most coursers and pratincoles, and the seed-snipes and sheathbills of South America and the Antarctic) together with herons, egrets and bitterns, storks, ibises, spoonbills, flamingoes, cranes and the limpkin and sun-bittern.

Virtually the whole of the book consists of species accounts. For well-known species these are typically divided into brief sections under the following headings: Description; Characteristics and Behaviour; Habitat; Food; Voice; Display; Breeding; and Distribution. Less well-known species (plus some that in truth are well known, such as American woodcock) have just a description section followed by a few lines on habitat and distribution. Of the 300-plus species covered, 96 are illustrated by a colour photograph and for these a small map of breeding distribution is included. Another 70 species are illustrated by attractive line drawings by John Tennent. The photographic credits reveal a heavy reliance on Eric Hosking's work, though the senior author has also contributed in good measure.

This is not an identification guide, neither is it a scientific monograph. Beyond a few asides in the introduction, there is no general discussion of wading birds and their environment. In particular, there are no introductions to orders, families or genera. Furthermore, within each genus, species are listed alphabetically by specific name which at times leads to related species being widely separated.

A one-page bibliography lists mainly regional works and a few on the groups covered, but there is little sign that primary sources have been consulted widely and there are several surprising omissions, such as *The Mystery of the Flamingos* by Leslie Brown and *Flamingos* edited by Janet Kear and Nicole Duplaix-Hall.

Readers wishing full and authoritative information on specific birds or groups would be advised to look elsewhere. But, as a popular introduction to several well-liked groups of birds, the book succeeds at a reasonable price. It is, though, a shame that the opportunity to update the information it contains has been missed. At the least, an updated further reading list should have been included.

MIKE EARP

We have also received *Lizards of the World,* by Chris Mattison, and published by Blandford at £14.95, ISBN 0 7137 2012 3 (hardback). Ed.

Pond Restoration and Flora at Fryent Country Park, Middlesex

by L. R. Williams*

Summary

Twenty-seven ponds were restored or created at Fryent Country Park, Middlesex, in the London Borough of Brent during the 1980s. The ponds have been colonised by 68 plant species, the distribution of which is described. Since the start of the pond restoration programme, several new species have been recorded in the ponds and many species have increased their range. About 22 species have been introduced. The results are discussed in relation to the conservation of pond flora.

Introduction

In recent years, there has been concern over the loss of farm ponds from lowland countryside in Britain. Day *et al.* (1982) referred to a 30% loss of ponds in parts of Leicestershire since 1930, a 35% loss in parts of Huntingdonshire between 1950 and 1969; and to an 82% loss in Bedfordshire since 1910. Brian *et al.* (1987) mentioned the 34% loss in the parish of Christleton, Cheshire between 1908 and 1972. The advent of piped water and intensive agricultural practices have made many ponds redundant in the rural economy. Once a pond is neglected, the process of natural succession continues until the pond reverts to dry land. Often this process is accentuated by drainage, land-fill and waste tipping. The result is a dramatic loss in habitat for invertebrates, amphibians and wetland flora. Many county floras have referred to the contraction in abundance and range of formerly common aquatic species.

In the early 1980s it was decided to try to reverse this decline in an enclave of countryside, now known as Fryent Country Park. The Country Park is situated on the London Clay of Middlesex (vice-county 21) and is about one square kilometre in area. It is surrounded by suburbia and bisected by Fryent Way (the A4140), but is managed as traditional countryside by the London Borough of Brent. Within a landscape of hedgerows, woodlands and hay meadows, most of the ponds had been neglected for several decades. Ponds marked on 19th and early 20th century maps had become so shallow that they survived as damp depressions in fields and only held water in winter. The aim of the pond restoration programme was to restore as many of the former ponds as practicable and where possible, to create new ponds.

Obviously, it was desirable that ponds should hold water for as much of the year as possible, though it was accepted that many farm ponds dry-up in dry summers. Ponds need not be deep, since London Clay holds water well and a maximum depth of one metre would enable ponds to hold water all year. Digging commenced at ponds A and Z (Figure 1) in 1981, but the work accelerated from 1983 onwards and has continued since. Machinery has been used when available, though much of the work has been done manually, especially by volunteers from Barn Hill Conservation Group. Twelve former farm ponds have now been restored and 14 new ponds have been created, all of them on the London Clay. The largest pond in the Park (Pond I), has retained water throughout and was designed by the landscape architect Humphry Repton in the 1790s (Williams, Cunnington and Hewlett 1985). Apart from its large size and landscape function on the top of a hill, this pond is atypical in being dug through pebble gravel, though the water is retained by the underlying London Clay. The total number of ponds in the Country Park is therefore 27.

The aims of this study were to record the flora of each pond. Previous studies

*116 Carlton Avenue West, Wembley, Middlesex HA0 3QX.

FIG. 1. Sketch map of 27 ponds at Fryent Country Park, Middlesex, mentioned in the text. Note that pond size is diagrammatic only. The internal lines represent hedgerows. Old farm ponds which have been restored are marked with an asterisk (*) in the key. Pond I was created in the 1790s. All other ponds were created during the 1980s. Pond names follow the field names as far as possible. A* Richards, B* Honey Slough, C* Lower Hydes, D Great Hydes, E* Upper Hydes, F Hedge 3 pond, G Clump, H Glade, I Fishpond, J* Long Down, K Great Cowlays south, L Great Cowlays mid, M* Great Cowlays north, N Little Cowlays west, O Little Cowlays east, P Little Hillcroach, Q* Dormers Meade, R* Warrens, S* Meade, T* Pages, U Homefield summit, V* Oldefield south, W Oldefield mid, X Oldefield north, Y Robert Southwell, Z* Gotfords, Aa Gotfords north.

of pond flora in London have been published for Bookham Common (Castell 1955) and for Epping Forest where Selby (1955) found 39 species in the seven ponds surveyed.

Methods

Species were recorded during frequent visits between 1983 and 1989; and by surveys in 1988 and 1989. Earlier records were made by C. J. Gardiner in 1982.

Results

Sixty-eight species were recorded during this study as listed in Table 1. Forty-six species were considered to be native and/or naturalised to the Country Park, though they may have been introduced in the past. Of these 25 were probably present in at least some of the ponds in 1982. The other native species may have been present in small quantities and hence missed during the 1982 survey work or were present in the buried seed-bank. For information on the vice-county status of species, reference should be made to Kent (1975) and Burton (1983).

As indicated in the Table, there is evidence that 22 of the species were introduced to the Country Park ponds during the 1980s. Of these, nine species were from garden ponds, six from the Welsh Harp Reservoir, three were purchased from a commercial nursery by the local authority, one was probably introduced by seed, one, *Ranunculus penicillatus*, was introduced from waste material from the Cheddar Gorge; while the origin of *Cardamine pratensis* lady's smock and *Apium nodiflorum* fool's water-cress are not known.

Once established many species, of both native and introduced origin, have been introduced to other ponds within the Country Park.

In addition to the species in the Table, several others occasionally colonised the pond margins during dry weather. These included *Plantago major* great plantain, *Aster novi-belgii* Michaelmas daisy, *Lactuca serriola* great lettuce and *Poa trivalis* rough meadow-grass.

Discussion

Ordnance Survey maps dating from the late 19th and early 20th centuries show that there were about 22 ponds in the Fryent Country Park area, though some of these were on the perimeter. A density of 22 ponds per square kilometre is above average for ancient countryside, though it is difficult to make accurate comparisons with other areas (Rackham 1986). During the 1920s and 1930s, Kingsbury and Wembley changed from rural farmland to suburban London. However, the Country Park area has remained as an enclave of countryside and some form of farming has continued until the present day. Twelve of the original ponds have been restored and a further 14 new ponds have been created. The ponds vary greatly in size, depth and shade from nearby trees. Many of the ponds are quite small in surface area. The landscape Fishpond (Pond I) on the summit of Barn Hill is the largest with an area of approximately 1,680 square metres. In winter, the total area of the 27 ponds is about 4,522 square metres, giving an average area of 167 square metres, *i.e.* about 13 metres square. Thus ponds still occupy less than 0.5% of the total Country Park area.

Machinery has been used at nine of the ponds to create or restore about 1,522 square metres of pond, while manual digging was used at about 20 ponds to produce an estimated 1,235 square metres of pond. Most of the routine pond management is also undertaken manually and follows the guidelines in Brooks (1976). For this purpose the need for an annual inspection and follow-up work is written into the management plan for the Country Park. More urgent work is undertaken as required. In the case of the Fishpond (Pond I), where visitor pressure is high, inspections are undertaken once a week during the spring and summer. The rapid growth of *Elodea* is a problem at this pond.

When restoring the former farm ponds, considerable effort was made to

retain any existing vegetation by working around it. On completion of the work, these ponds have been left to recolonise from this material and the disturbed seed bank. New ponds have required the introduction of plant material from nearby ponds or from the Welsh Harp Reservoir. Some species are very aggressive and are no longer introduced unless a single-species stand is the objective. These species include *Bidens tripartita* trifid bur-marigold, *Elodea* species, *Iris pseudocarus* yellow flag iris, *Typha latifolia* great reedmace and *Phragmites australis* Norfolk reed. Introductions have also been made by park users from their garden ponds and there is little that can be done to control this source of material.

Mallards, moorhens and herons are known to move between the ponds, but it is not known if they were responsible for the transfer of any plant material. Some species, *e.g. Typha latifolia* great reedmace, may spread by wind.

Ponds are considered as important habitats on lowland farmland and there is clear evidence that a high proportion of such ponds have been lost in recent decades. The creation of new ponds on farms has been suggested to help remedy this loss. Matthews (1987) includes several studies where up to four ponds had been created or restored on farms and pond wildlife had improved as a result. It was also noted that careful management of adjacent wetland features, such as damp fields and drainage ditches would benefit wildlife.

Brian, Price, Redwood and Wheeler (1987) noted that the number of pond species remaining in a geographical area declined more rapidly as more ponds were lost. As evidence for this, they plotted data from pond studies in Cheshire, Clwyd, Derbyshire and Leicestershire to achieve a reasonably close fit to an empirical model of their own data. It is of interest to compare their conclusions with the Fryent Country Park results. Using the results above and records made by C. J. Gardiner, it is estimated that about 25 species were present in the Country Park ponds in 1982. On the graph provided by Brian *et al.* (1987), this suggests a study area with between five and 10 ponds. In fact, there were about eight ponds in the Country Park in 1982, but all except one were very shallow and dried up in the dry summer of 1983. However, by 1989 there were 46 'native' species recorded in the 27 ponds, corresponding to between 25 and 30 ponds on the model graph. The Fryent Country Park results suggest that a pond restoration programme may make an important contribution to reversing the decline in pond flora. However, care should be taken with introductions, especially with aggressive species and where ponds are accessible to introductions from nearby garden ponds.

Acknowledgements

The pond restoration programme on which these results were based was made possible by the work of the London Borough of Brent and by many volunteers from Barn Hill Conservation Group. In particular I would like to thank Mike Andre, Monica Green and Kathy Northcroft. David Bevan, R. M. Burton and J. A. Moore helped with plant identification.

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TABLE 1. Flora recorded at 27 ponds in Fryent Country Park, 1982-89. The order follows Clapham, Tutin and Moore (1987) as far as possible. Information on abundance and the date of the first record are not given. Unless otherwise stated, species are considered native or naturalised to the Country Park ponds. The term native does not necessarily imply that a species is native to the vice-county and may include species that have become naturalised in the ponds prior to 1982.

Chara vulgaris: Pond Aa.
Caltha palustris marsh marigold: Established in one pond, O, where it was an introduction from a garden pond.
Ranunculus repens creeping buttercup: Recorded from Ponds A, B, C, D, E, F, G, H, J, K, L, M, N, O, P, Q, R, U, V, W, X, Y, Aa. An almost ubiquitous marginal, often present in the adjacent field vegetation.
Ranunculus lingua great spearwort: Introduced from garden ponds and by the local authority, the London Borough of Brent. Established in Ponds A, C, I and W.
Ranunculus sceleratus celery-leaved buttercup: Probably native, it was recorded from only two of the ponds, A and C, in 1982, but it has since colonised the exposed damp clay of restored and new ponds. Recorded in Ponds A, B, C, D, J, K, L, M, P, R, S, V, W, Y, Z, Aa.
Ranunculus peltatus common water-crowfoot: Probably native, it was recorded from Pond A in 1982 but has since been recorded from Ponds A, C, D, E, J, Q and Y.
Ranunculus penicillatus: Records from Pond V in 1987-88 followed the introduction of this species from waste material from the Cheddar Gorge in October 1986.
Nymphaea alba white water-lily: Introductions established in Ponds I, P, V and X, mainly from garden and ornamental ponds.
Nuphar lutea yellow water-lily: Introduction, possibly by the local authority, into Pond I.
Ceratophyllum demersum rigid hornwort: Ponds C and I.
Cardamine pratensis lady's smock: Present on the damp clay of Pond O, its origin is not known.
Cardamine impatiens narrow-leaved bitter-cress: A bank-side plant of Ponds C and T. In 1989 it was found growing in the exposed clay of Pond T.
Cardamine flexuosa wood bitter-cress: A hedgerow ditch plant by Pond Aa.
Rorippa sylvestris creeping yellow-cress: Ponds V and Y.
Rorippa palustris marsh yellow-cress: Ponds B, C and V.
Rorippa amphibia great yellow-cress: Ponds D and P.
Impatiens glandulifera policeman's-helmet: Introduction to marginal vegetation of Pond P, probably from the Welsh Harp Reservoir.
Lotus uliginosus marsh birdsfoot-trefoil: Pond R.
Filipendula ulmaria meadowsweet: A hedgerow ditch plant on the banks of Ponds R and S.
Prunus spinosa blackthorn: Growing in Pond C; but occurs as a hedgerow tree adjacent to several of the other ponds.
Epilobium hirsutum great hairy willowherb: A marginal plant at Ponds A, B, E, F, K, P, Q, R, S, T, Aa.
Callitriche stagnalis: Since 1982 when the only record of this species was in a ditch, it has been recorded from Ponds A, C, D, E, F, J, M, P, R, X, Y; and from Pond B in 1984 only.
Callitriche hamulata: Ponds C, F, J, P and Y. It may also be present at other ponds but can be confused with *C. stagnalis*.
Apium nodiflorum fool's water-cress: This species has been found at Pond P, but its origin is not known.
Angelica sylvestris wild angelica: Present at Pond P, probably as an introduction from the Welsh Harp Reservoir.
Polygonum amphibium amphibious bistort: Pond J (probably native) and at Pond V where it is probably an introduction.

Polygonum persicaria redshank: Often found on damp and exposed clay at Ponds C, H, K, L, M, Q, S, V, Y and Z.
Salix fragilis crack willow: A tree has grown in Pond C for many years.
Salix cinerea common sallow: Ponds C and G.
Menyanthes trifoliata bogbean: Introduction from garden ponds to Ponds C, P and V.
Myosotis laxa ssp. *caespitosa* water forget-me-not: Pond V, probably an introduction from a garden pond.
Solanum dulcamara bittersweet: Ponds A, B, C, E, J, M, P, R, T and V.
Scrophularia nodosa figwort: Ponds R and X.
Mentha aquatica water mint: Ponds A, B, C, D, E, O, P, Q, W and X. All of these may be introductions, initially from the Welsh Harp Reservoir.
Stachys palustris marsh woundwort: The origin of this species at Pond Y is possibly as an introduction from seed by a member of the public.
Bidens cernua nodding bur-marigold: Pond I.
Bidens tripartita trifid bur-marigold: Ponds A, B, C, H, I, K, L, P, V and Z.
Tussilago farfara coltsfoot: Bankside or shallow water plant at Ponds A, B and O.
Gnaphalium uliginosum marsh cudweed: Ponds H, V and Y.
Alisma plantago-aquatica water plantain: In 1982 this species was recorded at Pond A only, but has since been recorded in Ponds A, B, C, D, E, F, J, O, P, Q, W, Y and Z. The increase in range was encouraged by introductions from Pond A.
Alisma lanceolatum water plantain: Introduction at Pond O from a garden pond.
Butomus umbellatus flowering rush: Introduction from a garden pond to Pond O where it flowered in 1987. It was not seen in 1989 and may have been lost during earth moving works.
Elodea canadensis Canadian pondweed: The separation of this species from *E. nuttallii* has often been confused. Most of the material collected from the Country Park ponds in 1988-89 would appear to be *E. nuttallii* if the key in Simpson (1988) is followed. *E. canadensis* has been reported from Ponds D, E, I, P and Q. Possibly over recorded.
Elodea nuttallii: Ponds D, E, I, P, V, W, X and Y. Possibly under-recorded.
Potamogeton natans pondweed: Ponds A and C; possibly native.
Potamogeton crispus curled pondweed: Ponds D, I and W.
Juncus bufonius toad rush: On damp and exposed clay at Ponds C, H, P, Q and R.
Juncus inflexus hard rush: Ponds A, C, D and P.
Juncus effusus soft rush: Ponds A, B, C, D, E, H, I, J, M, N, P, Q, R, S, T, V, Y, Z and Aa.
Juncus conglomeratus conglomerate rush: Ponds N, P and R.
Juncus articulatus jointed rush: Ponds A, B, C, D, P and W.
Iris pseudacorus yellow flag iris: Since 1982, when this species was recorded at Pond Z, it has been introduced or has colonised Ponds C, D, F, G, H, I, M, N, O, P, Q, U, V, W, X, Y, Z and Aa.
Acorus calamus sweet flag: Introduction, probably by the local authority, to Pond I, found in flower in 1989.
Lemna minor duckweed: Ponds A, B, C, E, I, J, M, N, V, W and Z.
Lemna minuscula: Pond B (1987).
Sparganium erectum branched bur-reed: Native in Pond A (1982). Seed and plant introductions from this pond to Ponds B, D, E, F and W. Also present at Pond Z.
Typha latifolia great reedmace: Introduced to Ponds D and P from the Welsh Harp Reservoir. Wind dispersal of seeds may be responsible for the more recent records from Ponds A, J, R and Y.
Typha angustifolia lesser reedmace: Introduction to Pond I by the local authority.
Cyperus longus galingale: Introduction from garden ponds to Ponds O and V.
Carex hirta hairy sedge: Ponds A, E, N, R, S and Z.
Carex otrubae false fox-sedge: Native in Ponds B, C and T.
Glyceria fluitans flote-grass: Ponds A, B, D, E, G, H, I, J, K, L, M, P, Q, R, S, U, V, W, X, Y, Z and Aa.
Glyceria declinata: Pond I.
Deschampsia cespitosa tufted hair-grass: Ponds A, B, C, E, G, R, Y and Z.
Alopecurus geniculatus marsh foxtail: Ponds C, F, H, I, J, K, L, M, P, Q, R, S, T, U, V, W, X, Y, Z and Aa.
Phalaris arundinacea reed-grass: Introduction to Ponds D and P from the Welsh Harp Reservoir.
Phalaris arundinacea var. *picta* ribbon grass: Introduction to Pond I from a garden pond.
Phragmites australis Norfolk reed: Rootstock were introduced from the Welsh Harp Reservoir and a small reed-bed has grown in Pond P.

The Horniman Wildflower Meadow the Year After it was Sown: A Quantitative Study

by Ruth Day*

Summary

A wildflower meadow on a south-east London site was surveyed 14 months after sowing by means of contiguous quadrats placed along four transects. The frequency and dominance of both deliberately sown and self-sown plants found in each quadrat were assessed.

Introduction

During the 1980s there has been increasing interest in the creation and management of 'wildflower meadows' in towns and cities, but though there are now a number of texts on how to sow your meadow (Baines and Smart 1984, Wells *et al.* 1989) most of the data on how these 'floristically rich grasslands' have fared have been purely anecdotal. The St Helens, Knowsley and Sefton Groundwork Trust has carried out a three-year research project ending in 1990 (Nature Conservancy Council 1989) but the results of this are not yet available. The Horniman meadow was sown in March 1988 and the survey described below was carried out 14 months later.

Site Description

The Horniman Museum Railway Nature Trail in the Borough of Lewisham (TQ 347734) is a strip of land approximately 700 metres long and 35 metres wide running north/south next to the Horniman Gardens between London Road and Langton Rise, Forest Hill, London SE23. Originally it formed part of the London, Chatham and Dover Railway Company's high-level line from Holborn Viaduct to Crystal Palace, which was opened in 1865 and closed in 1954 (Jackson 1978, Day 1986). Camille Pissarro's 'Lordship Lane Station', which hangs in the Courtauld Gallery, shows a steam train just after it had left this section of the line when the railway was in its heyday in 1871. The hill at the back on the right-hand side is now the Horniman Gardens and the foreground is now part of the Sydenham Hill Wood local nature reserve in the Borough of Southwark. The Borough boundary lies along London Road. The line was dismantled in 1956/7 and all 48 acres of its independent length were bought by the L.C.C. for housing. Council estates were built on other parts of the former railway line, but the section next to the Horniman Gardens was left undisturbed and nature took over. In 1970 it was made available to the Education Department of The Horniman Museum as an educational resource to be managed by the G.L.C. Parks Department and the land was formally transferred in 1973. Following the demise of the G.L.C. and I.L.E.A. it now belongs to The Horniman Museum.

This section of former railway line is now a nature trail. It resembles a woodland path. A few of the trees remain from the original Great North Wood (Lousley 1958, 1959, Neville 1987), but most were self-sown after the railway was built. When I made a survey of the site in 1986 (Day 1986), there were 255 sycamores *Acer pseudoplatanus,* some of them very large, 92 goat willow *Salix caprea,* 71 ash *Fraxinus excelsior,* 70 silver birch *Betula pendula* and 68 oaks of both native species *Quercus petraea* and *Q. robur,* as well as a few planted exotics.

At the north end of the nature trail, however, the land is more open. The

*18 Zenoria Street, London SE22 8HP.

dominant tree in that section of trail is ash, which grows on a steep bank on the east of the site and next to this, where the railway entered a cutting under Langton Rise, there are no trees. A little pond was dug here in 1974 and colonised by smooth newts *Triturus vulgaris,* common frogs *Rana temporaria,* toads *Bufo bufo* and southern hawker dragonflies *Aeshna cyanea.* In 1986 the cutting behind had been partially filled in, but was being used by local people as a dump for garden rubbish in black plastic sacks. The management plan I proposed therefore recommended that the cutting be completely filled in and a wildflower meadow sown on the top.

During 1987 the cutting was filled in with:

(a) Topsoil, which was banked against the raised path at the west of the area in a band approximately 3 metres wide.

(b) Clay subsoil, excavated next to The Horniman Museum, when the Conservatory from Frederick Horniman's Croydon house was resited as an annexe to the Museum. This clay, which covered the rest of the former cutting to the line of the trees, was sloped down to drain into the pond and was banked up against the fence at the north of the site. A covering of topsoil to a depth of approximately 5mm was spread over the clay immediately before the grass and flower seeds were sown in March 1988. The flower seeds were a special mixture for heavy, clay soil supplied by Mommersteeg Seed Company of Wellingborough, Northants. Hawthorn whips, together with a few other shrubs, were planted in March 1989 to form a hedge round three sides of the meadow.

Aims

The aims of the survey were:
— to compare the plant species present in the meadow with those sown in March 1988.
— to estimate the frequency of occurrence of the species found,
— to assess the relative dominance of the more abundant species,
— to ascertain whether there was any difference in species mix or dominance along the line of the transects or between parallel areas in different transects.

Methods

The meadow was surveyed on 29 May 1989 along the line of transects drawn from the raised path on the west side of the meadow in an easterly direction towards the trees. This method was preferred to the alternative of random quadrats because it seemed likely that there would be three distinct zones:

i. The first three metres which had been covered in topsoil and would therefore be richer in nutrients than the rest of the meadow.

ii. The central area, which apart from a very thin layer of topsoil, consisted of nutrient-poor clay subsoil from the excavation site. It had no shelter, so might be expected to lose moisture rapidly by evaporation.

iii. The last two metres nearest the trees, where woodland edge effects might be expected.

Transect starting-points two metres apart were pegged out on the ground in a line just inside the line of the hawthorn whips. They were lettered A–L and extended from a point seven metres south of the fence to the beginning of the slope down to the pond. In practice, work was done on four transects, C, D, E and H, respectively 11, 13, 15 and 23 metres from the fence abutting Langton Rise and parallel with it. A map of the meadow is shown in Figure 1.

Square quadrats, each ½m square, were placed next to each other long the transect line and to the south of it. Thirty quadrats were surveyed along transect C, seven along transect D, 49 along transect E and 54 along transect H.

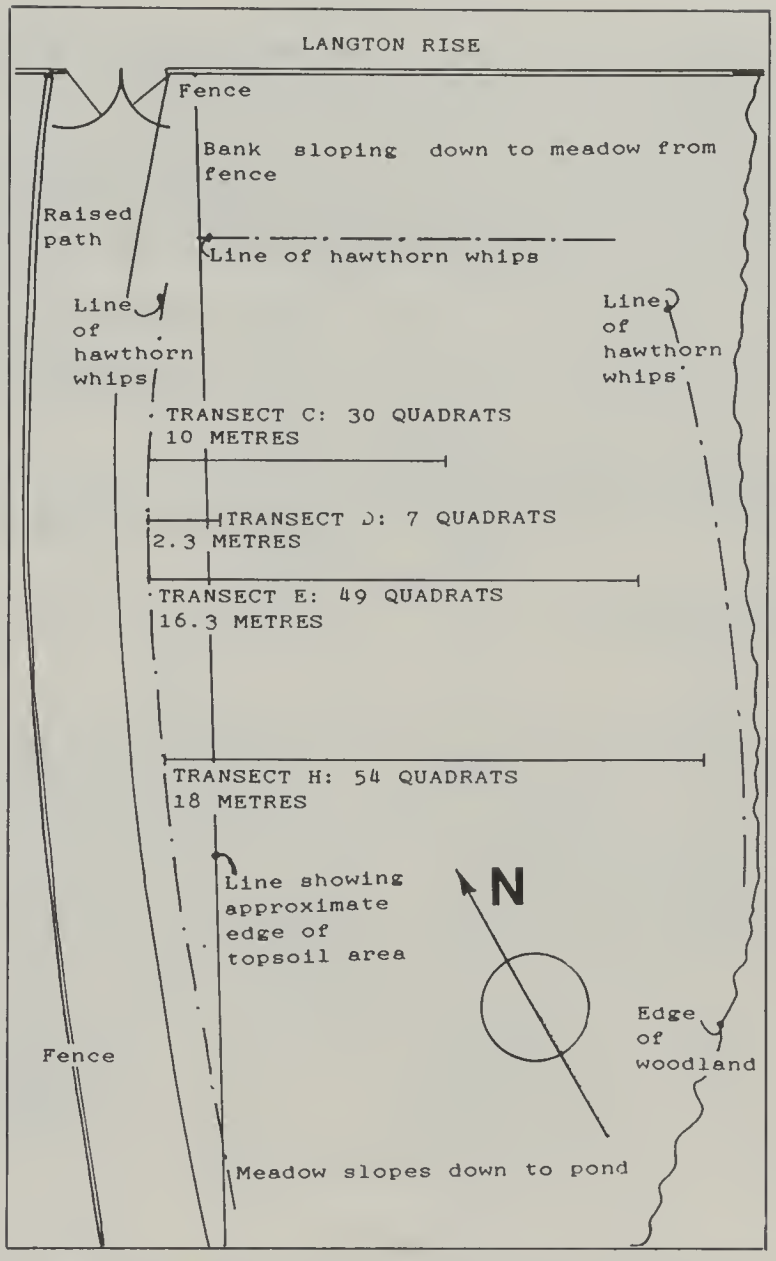

Fig. 1. Map of the Horniman Meadow, showing the position of the transects.

The plant species found in each quadrat were noted, together with an estimate of the percentage of ground covered in that quadrat by that species. Rose (1981) was used as a reference for the forbs and Hubbard (1968) for the grasses. Field estimates were then converted to the Braun-Blanquet scale to smooth out differences in raw percentages estimated by different observers. The Braun-Blanquet scale is as follows: 1 = 1%–5%, 2 = 6%–25%, 3 = 26%–50%, 4 = 51%–75% and 5 = 76%–100%.

Results

Thirteen of the 20 wildflower species sown were found in the transects surveyed. The other seven were not found, but may be present elsewhere in the meadow. An additional 24 broad-leaved species (forbs) were self sown. Of these 37

species however, only 12 had both a frequency greater than 10% in any individual transect and a dominance on the Braun-Blanquet scale greater than 1 in any individual quadrat. These 12 species, six sown and six self-sown were analysed further.

Three grass species were sown. Of these only one, *Festuca rubra,* was found in the quadrats. As the other two sown species together accounted for only 20% of the grass mixture, this is not hard to understand. The other eight grass species found were self-sown. *Arrhenatherum elatius* and *Bromus sterilis* occurred infrequently and only in the first seven quadrats.

The dominant plants found in the survey therefore were 12 forbs and seven grasses.

Because of the way the survey team worked, there are more data for the beginning of the transects (on the topsoil) than for the end (woodland edge). Data have therefore been analysed in five blocks:

i. The first seven quadrats of four transects.

ii. Quadrats 8-23 (16 quadrats) of three transects.

iii. Quadrats 24-30 (seven quadrats in the middle of the meadow) of three transects.

iv. Quadrats 31 to the last seven (17 quadrats of one transect and 11 of the other) of two transects.

v. The last seven (woodland edge) quadrats of two transects.

Blocks **i, iii** and **v** provide a more or less direct comparison of three different habitats: **i,** the unshaded topsoil, **iii,** the unshaded clay in the middle of the meadow and **v,** the woodland edge on clay. As Table 6 shows, the topsoil had a mean number of 22 species, the unshaded clay 10 and the woodland edge 14. The intervening sections **ii** and **iv** show the expected gradation.

As the bar charts (Figures 2 and 3) show, the dominance of the main seven grasses was pretty even. Only four of them, however, occurred in the middle seven quadrats and only two, *Cynosaurus cristatus* and *Poa pratensis,* showed a higher than 50% frequency. *Holcus lanatus* appeared to have done very much better on the nutrient-rich topsoil and *Alopecurus pratensis* was most frequent towards, but not at, the woodland edge, implying a greater need for moisture.

Both frequency (Figure 4) and dominance (Figure 5) of the sown forbs is pretty even and not very high. What the bar charts for self-sown forbs (Figures 6 and 7) show very clearly and what was very evident to visual inspection, is the extent to which red clover *Trifolium pratense* has colonised, followed by white clover *Trifolium repens* and curled dock *Rumex crispus.*

Discussion

When mowing is reduced on urban 'green desert', the rich soil enables a few aggressive species to take over and the result is rough grassland, not lots of wild flowers (Nature Conservancy Council 1989). This has occurred to a certain extent in the topsoil part of the Horniman Meadow, which appears dominated by docks and plantains. It is encouraging, however, that the wildflower seeds appear to have germinated over the full area, and are holding their own against white clover and curled dock in the open clay. The red clover could be more of a problem. If it persists, it will increase soil fertility and encourage aggressive 'weedy' species.

The Horniman Meadow covers only 680 square metres. It is bound to be invaded from adjoining land. Indeed on 5 June 1988, just over two months after the meadow was sown, 382 sycamore seedlings were weeded from the site. Our management aim is to remove all mowings and keep the nutrient balance low. Only time will tell how successful we shall be.

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Acknowledgement

I wish to thank the other members of the survey team, Rosa Davis, Robin Robbins and Brian Starkey.

TABLE 1. Grass seed mixture mixed with wild flower seeds and sown in March 1988.

%	**Species**	%	**Cultivar**
10	*Agrostis castellana*	10	Browntop
80	*Festuca rubra*	20	Waldorf ssp. *commutata*
		20	Banner ssp. *commutata*
		40	Dawson ssp. *litoralis*
10	*Phleum bertolini*	10	Turf Timothy diploid S.50

TABLE 2. Grasses which were found in one or more of the transects.

Alopecurus pratensis	meadow fox-tail
Arrhenatherum elatius	false oatgrass
Bromus sterilis	barren brome
Cynosurus cristatus	crested dog's-tail
Dactylis glomerata	cocksfoot grass
Festuca rubra	red fescue
Holcus lanatus	Yorkshire fog
Lolium perenne	perennial rye-grass
Poa pratensis	smooth meadow-grass

TABLE 3. Forbs which were deliberately sown and which were found in one or more of the transects.

Achillea millefolium	yarrow
Anthyllis vulneraria	kidney vetch
Chrysanthemum leucanthemum	oxeye daisy
Daucus carota	wild carrot
Lotus corniculatus	birdsfoot trefoil
Medicago lupulina	black medick
Plantago lanceolata	ribwort plantain
Plantago media	hoary plantain
Poterium sanguisorba	salad burnet
Ranunculus acris	meadow buttercup
Rumex acetosa	sorrel
Vicia tetrasperma	smooth tare

TABLE 4. Forbs which were deliberately sown and which were not found in the transects.

Centaurea nigra	black (common) knapweed
Centaurea scabiosa	greater knapweed
Galium verum	lady's bedstraw
Knautia arvensis	field seabious
Primula veris	cowslip
Prunella vulgaris	selfheal
Rhinanthus minor	yellow rattle

TABLE 5. Self-sown forbs which were found in one or more of the transects.

Arabidopsis thaliana	thale cress
Barbarea vulgaris	winter-cress
Calystegia sepium	hedge bindweed
Carduus acanthoides	welted thistle
Circium arvense	creeping thistle
Conopodium majus	pignut
Crataegus monogyna	hawthorn
Geranium dissectum	cut-leaved cranesbill
Lamium album	white deadnettle
Leontodon autumnalis	autumn hawkbit
Plantago major	greater plantain
Reynoutria japonica	Japanese knotweed
Quercus sp.	oak
Ranunculus repens	creeping buttercup
Rumex crispus	curled dock
Rumex obtusifolius	broad-leaved dock
Senecio jacobaea	common ragwort
Senecio squalidus	Oxford ragwort
Sisymbrium officinale	hedge mustard
Taraxacum officinale	dandelion
Trifolium hybridum	alsike clover
Trifolium pratense	red clover
Trifolium repens	white clover
Urtica dioica	stinging nettle

TABLE 6. Number of species found in transects.

First 7 quadrats	Quadrats 8–23	Quadrats 24–30	Quadrats 31–last 7	Last 7 quadrats
C D E H	C E H	C E H	E H	E H
26 26 18 17	27 16 17	9 10 11	12 14	15 13
Mean 22	Mean 16	Mean 10	Mean 13	Mean 14

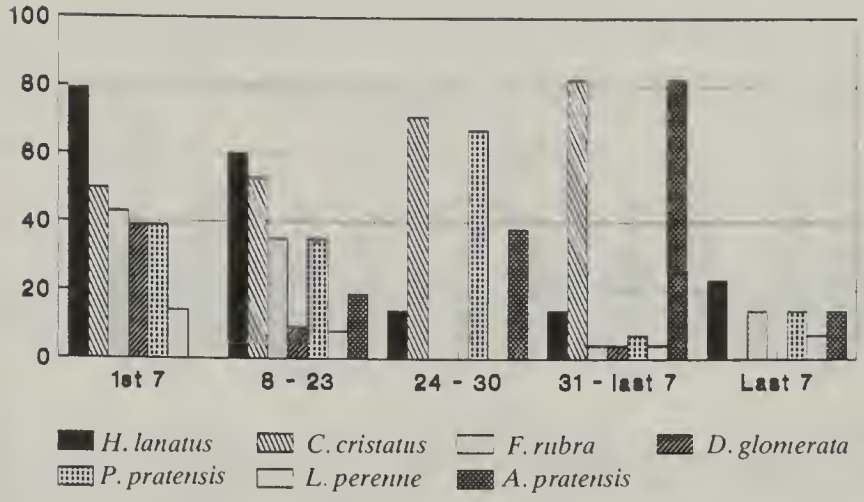


FIG. 2. % frequency of grasses.

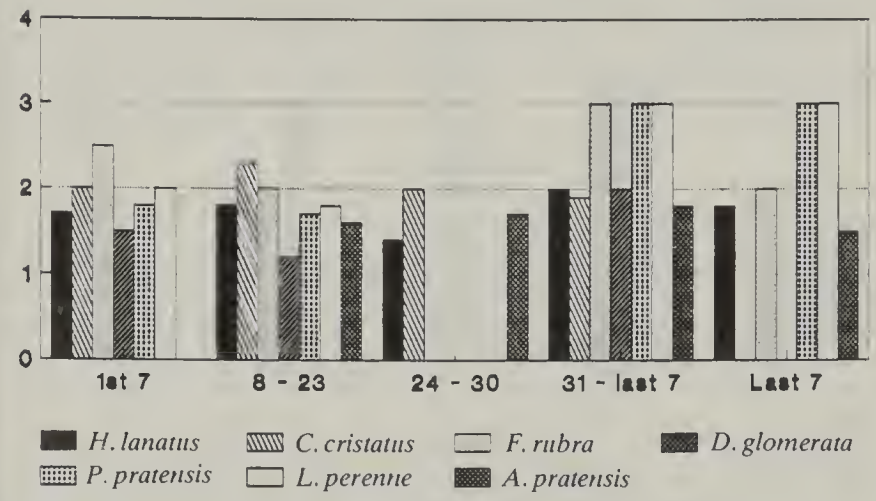


FIG. 3. Mean dominance of grasses on the Braun-Blanquet scale.

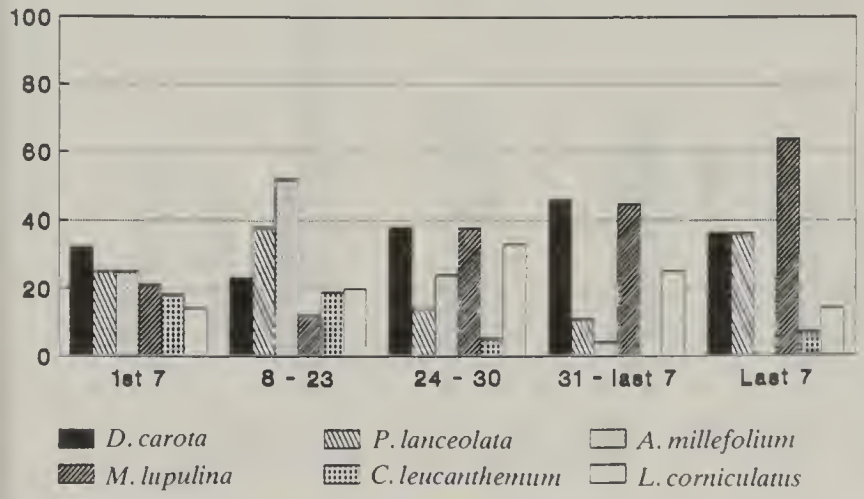


FIG. 4. % frequency of principal forbs deliberately sown.

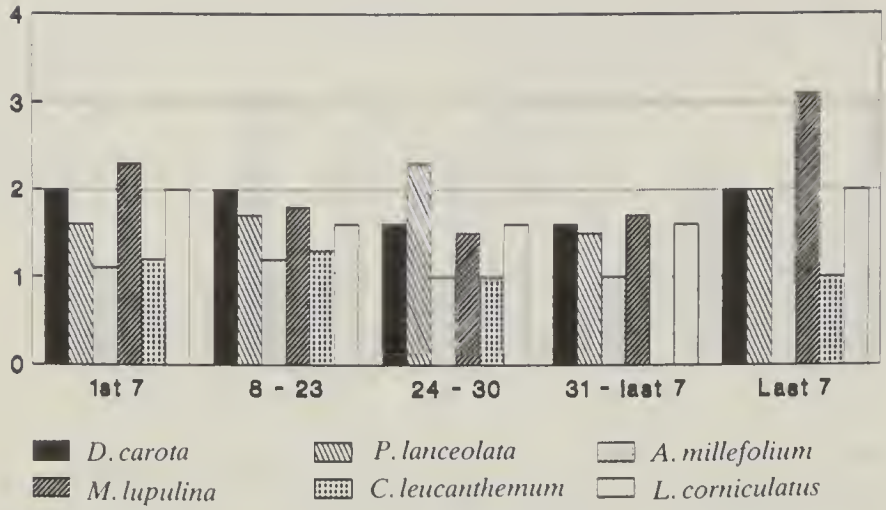


FIG. 5. Mean dominance on the Braun-Blanquet scale of principal forbs deliberately sown.

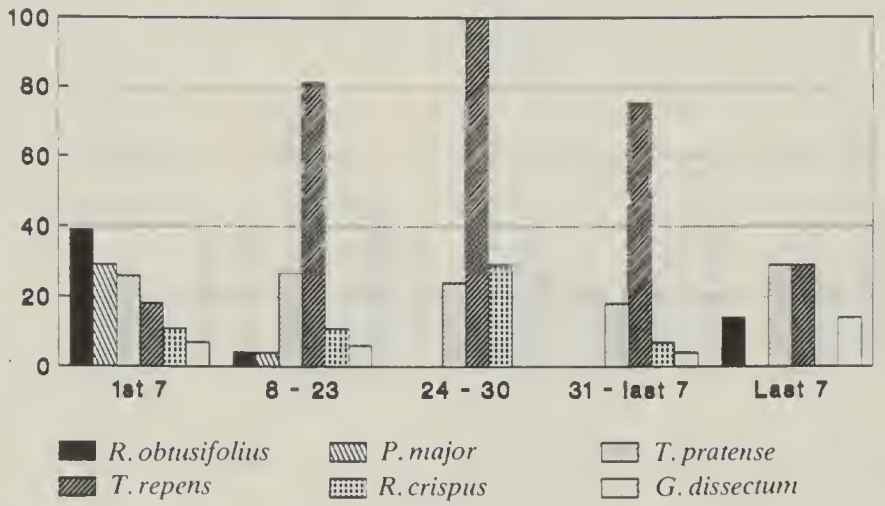


FIG. 6. % frequeney of self-sown forbs.

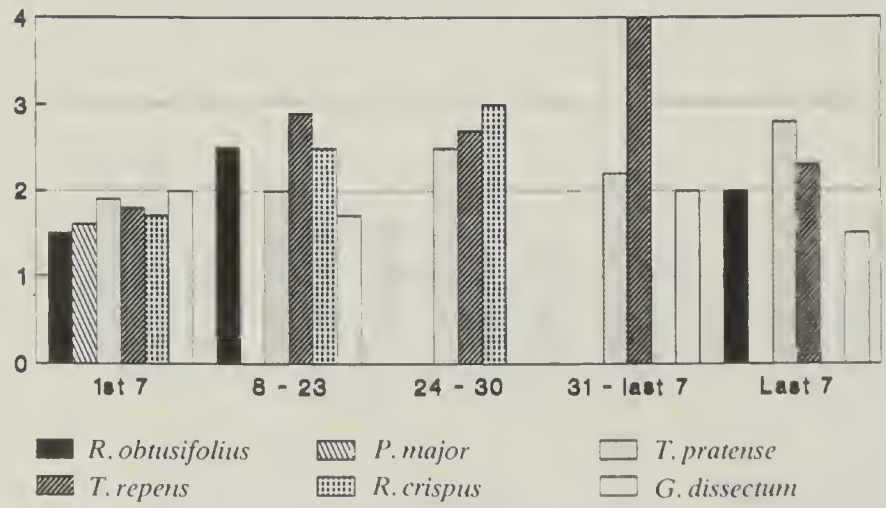


FIG. 7. Mean dominance on the Braun-Blanquet scale of self-sown forbs.

A Tree-by-Tree Survey of the Effect of the October 1987 Storm on the Willett Memorial Wood, Petts Wood

by Kenneth H. Palmer*

(Our thanks are due to The National Trust Petts Wood Management Committee for permission to publish this paper which is based on a report 'Counting the Cost' prepared by Mr Palmer for that Committee. A copy of 'Counting the Cost' is lodged with the L.N.H.S. records. The full report contains more detail on a sector-by-sector basis, data which are of particular use for local management plans.)

Summary

The storm which ravaged much of south-east England during the night of 15-16 October 1987 completely changed the appearance of The National Trust Woodlands at Petts Wood in the London Borough of Bromley. This paper describes a detailed survey carried out to assess the true effect of the storm on one of these woods — the Willett Memorial Wood. Every tree above a threshhold size was individually counted and recorded by damage level and species. Methods used to achieve this included dividing the 34-hectare wood into 48 sectors and measuring the size of each sector: 18,507 trees of 34 species were counted of which 31.2% had been blown down by the storm. The larch suffered highest losses and the birch suffered much more than the oak, altering the ratio of these two dominant species.

Background

The early hours of the morning of 16 October 1987 are unlikely to be easily forgotten. Winds of a strength unknown locally in living memory ravaged much of south-east England, bringing down trees and cables and causing structural damage. Power failures were widespread and at first light bewildered residents began to emerge from their houses to view a totally unfamiliar scene. In Chislehurst, huge, fallen trees blocked roads; others rested on roofs or garages. While damage to private property occupied immediate attention it was not long before news was filtering through of a great devastation in the nearby Petts Wood and St Paul's Cray Common that had completely altered the appearance and character of these familiar woodlands. Already estimates of the damage there were becoming the topic of conversation, estimates that varied from one in three trees lost to more than 60%.

Much of these woodlands are owned by The National Trust and are managed by the Petts Wood Management Committee. In particular, this Committee is responsible for the two woods known as the Willett Memorial Wood and the Edlmann Wood totalling 54 hectares (135 acres). At its next meeting the Committee recognised the importance of determining just how great was the damage caused by the storm and commissioned the author, one of the Committee members, to be responsible for organising an appropriate survey. Aside from revealing the true extent of the damage, the survey should also provide an inventory of what trees remain, thus providing a basis on which to formulate plans for rebuilding the woods.

Early attempts to recruit a team to carry out the survey proved unsuccessful. The twin requirements of time availability and confidence in identifying tree species without the help of foliage proved too demanding. The survey thus became a one-man task and was confined to the single wood, Willett Memorial. This wood was far more affected by the storm than was the Edlmann Wood. The opportunity to extend the survey to this latter wood at a later date is not, of course, precluded.

*55 Clarendon Way, Chislehurst, Kent BR7 6RG.

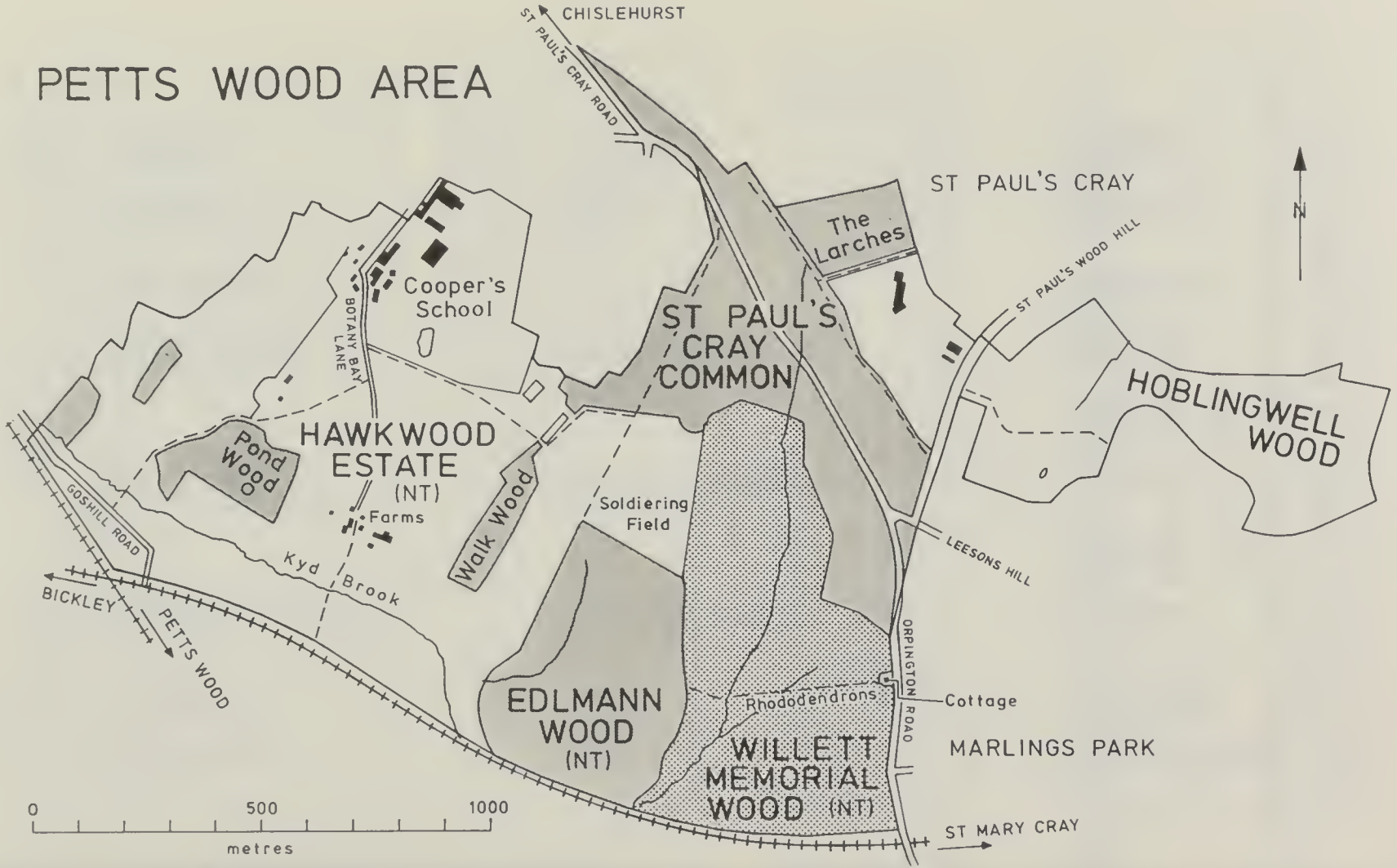


FIG. 1. Map showing the Willett Memorial Wood in relation to surrounding features.

Methods

The Willett Memorial Wood

The Willett Memorial Wood covers an area of about 34 hectares (84 acres), extending from the railway line in the south to the Willett Memorial sun-dial in the north. It is bounded on the east first by the Orpington Road and later by a boundary bank separating it from St Paul's Cray Common. The western boundary is formed by the Edlmann Wood in the south and the Soldiering Field in the north. Figure 1 shows this wood in relation to its surrounding features. A stream runs more or less north/south through the wood and is joined by a side stream which flows NE/SW. Along the course of both streams the ground is both lower and wetter than in the surrounding woodland. A rhododendron walk extends west from the Warden's cottage situated on the Orpington Road and terminates near to the stream.

Full or Partial Survey?

Before the survey could start, several decisions needed to be made. Firstly, could the objectives of the survey be met without covering every part of the wood? A casual inspection of the damage showed how unevenly the storm had struck and it seemed unlikely that an accurate estimate of the damage would be obtained from random samples. Certainly the second objective of obtaining a tree inventory would require total coverage.

Size of Tree to Include

The second decision concerned which trees should be included in the count. Clearly it would not be practical or meaningful to include every small sapling or seedling. But how should the cut-off point be determined? Initial thoughts here were that this should, perhaps, vary with the tree species, but this proved to be entirely impractical requiring frequent measurement with a tape linked to constant reference to a table of critical tree girths. To avoid slowing the survey down to an unacceptable rate, a basically simple method was needed. After some experiment a method based on encircling the trunk of the tree at shoulder height with the hand was decided on. If the thumb and middle finger met, the tree was not included in the count. This tree size, which corresponds to a girth of about 16 cm at a height of 1.5 metres, approximates the size of the smallest trees that were blown down by the wind (as opposed to being brought down by larger trees). As such they tend to form a natural cut-off point for a survey of this nature. It must be stressed, however, that the choice of this cut-off size is both arbitrary and important. A smaller cut-off would lead to a lower damage level since very few trees below this size were affected by the storm. While this cut-off size was applied to nearly all the tree species some subjective judgement was permitted for the more shrubby, multi-stemmed species such as hazel. In practice it became relatively easy to judge visually whether or not a tree qualified by size for inclusion in the survey and only occasionally was it necessary to check the hand measurement.

Tree Species

All plants generally accepted as being trees or tree-like were counted. This included such species as elder, hawthorn, hazel and holly. Rhododendron was not included. Where possible the actual species was determined, but where separation was difficult a more general category was used. Thus the vast majority of oaks in the wood are English oaks *Quercus robur*, but a few closely related species also exist. Only where these could be readily recognised (without leaf or acorn) were they recorded separately. Thus the survey includes records of Turkey oak and holm oak, but the others are lumped together as 'oaks'.

Damage Levels

Each tree counted was classified into one of three damage levels – undamaged;

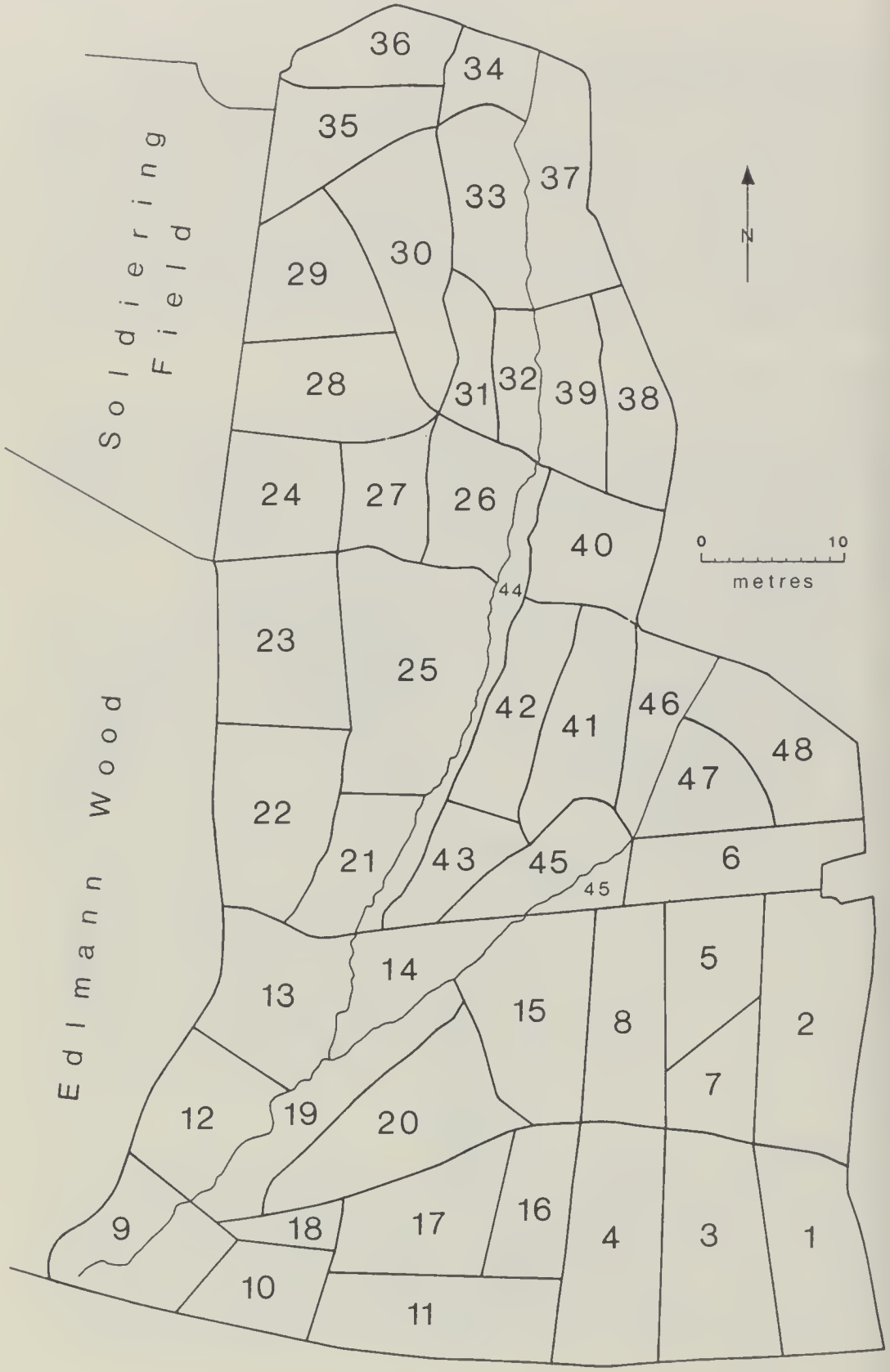


Fig. 2. Willett Memorial Wood showing the 48 sectors used in the survey.

damaged; fallen. 'Undamaged' included all trees virtually unaffected by the storm apart from minor damage to some branches. 'Damaged' implied that the tree was still standing and living, but had lost at least one major bough or suffered some noticeable root disturbance. 'Fallen' included all trees uprooted by the storm or snapped off below the first major bough. Trees that would have fallen, but came to rest on other trees, were included in this category. Although this category was intended to denote trees which have been lost to the wood, nearly all those that were uprooted were still alive at the time of the survey and indeed have come into full leaf subsequently. They can, however, be expected to have a shorter life-span than trees in the other two categories.

Dividing the Wood into Sectors

To carry out the survey systematically, the wood was divided into sectors as the survey progressed. Experience showed that an area of between 0.5 and 0.8 hectares could conveniently be covered in two to three hours and that this was an optimal sector size. Since data on tree density in different parts of the wood pre- and post-storm would provide a useful basis for future management plans, it was important that the size of each surveyed sector be known quite accurately. This could most easily be achieved if the sectors were chosen to be nearly rectangular in shape. It was, however, even more important to be able to tell exactly where one sector ended and the next began so that trees would not be missed or double-counted. This could best be achieved by using non-rectangular foot-paths as the boundaries. The early sectors were chosen as rectangles, but as the survey proceeded the choice of natural features as boundaries was found to be more important even though this involved a more complex area determination. Areas were then measured by a combination of metre strides and compass directions. The results were later drawn up on squared paper with ruler and protractor and the area found by counting squares. With care and cross-checking, this method yielded accurate results. While white chalk was used to mark trees counted during the survey of any one sector this could not be relied upon to mark sector boundaries since it was invariably washed away by the first rain storm. In the event a total of 48 sectors was surveyed separately covering the whole of the Willett Memorial Wood. These are shown in more detail in Figure 2 and vary in size from 0.30 ha (Sector 18) to 1.34 ha (Sector 25). The sectors are numbered in the order in which they were surveyed.

Recording Form

A recording form was used in the field to record the results of a sector. Only some of the more general tree species were pre-printed on the form. Others were entered as they were counted. Rows of dots allowed up to 50 trees to be recorded on one line by use of three separate symbols denoting the damage levels. In order to determine the effect of the storm on trees of different size a separate account of the large mature oaks was kept by placing an M over the damage symbol.

Choosing a Path

Perhaps the most difficult part of the survey was to follow a path within a sector that would ensure that all trees were counted and counted only once. It was soon found that the use of chalk, or at least some means of marking trees, was absolutely essential. But while this guarded against double counting it did not, of course, ensure that every tree was visited. Here the choice of route through the sector became important. Subdividing a sector into smaller areas bounded by tracks and surveying these completely before moving on was useful. Much more difficult was following a path that went from one end of a sector and back in swathes about twenty metres wide. Storm damage made such straight-line transects very difficult to keep to and a compass was important to avoid diverging significantly from the target direction. In badly damaged areas nearly all uprooted trees lay north/south with their roots to the south. In areas such

as these there was considerable advantage in always moving from south to north so that roots would be encountered before crowns. It was then important to make sure that large, fallen trees were chalk-marked close to the root so that the mark could be located subsequently. Most difficult of all were the dense groves of young oaks located around Sector 30 and essentially untouched by the storm. To count these it was necessary to ensure that every tree was marked on the same side so that all the marks could be examined from a distance to look for missing ones.

Effect of Weather
Surveys could only be made on days when there was no rain and preferably when the trunks were dry. On only one occasion did rain interrupt a sector survey — number 13 — making it very difficult to pick up after the chalk marks had been washed away.

Time Taken
The first sector was surveyed on 16 November 1987 and the last on 2 April 1988. A total of 48 visits on different days was required to complete the survey involving 108 hours' counting.

Use of Computer
After each survey the results were immediately entered into a computer database for storage and analysis. Most of this work was done using LOTUS 1-2-3 on an IBM-compatible PC.

Results

Summary Table
Table 1 is a summary of the survey results for the whole wood. This shows that a total of over 18,000 trees was counted and that 31.2% of these were 'fallen' (as previously defined). If the 'damaged' trees are included then 47.5% of all trees were either blown down or significantly damaged.

The main body of the Table is a summary for each of the 34 tree species found during the survey arranged in order of abundance pre-storm. This shows for each species both the total number of trees and a breakdown by damage level.

In discussing the results of the survey it is useful to refer to the situation before and after the storm. For the purpose of this report the figures shown in the first column (Total) represent pre-storm. Post-storm is taken to be the sum of columns 2 (Not damaged) and 3 (Damaged), *i.e.* the trees described as fallen (column 4) are assumed lost due to the storm even though, as previously noted, many of these survived the winter and were in full leaf the following spring. Thus the survey shows that before the storm there were 9,647 birch trees (above the cut-off size) in the whole wood and that after the storm only 5,557 remain representing a loss of 4,090 trees (42.4%).

The Trees
Table 1 shows that the tree worst hit by the storm was, perhaps surprisingly, the larch with 88.2% lost. Only six of the 51 larches in the wood remain and two of these are damaged. One of those remaining undamaged is a young tree. Second to the larch, ignoring trees of which there were less than 10 pre-storm, the sallow or goat willow suffered most with a loss of 54.55%. The two most common trees in the wood, birch and oak, fared quite differently from one another. Losses were high among birch, but relatively slight among oak (17.9%). Oak loss may have appeared to be higher at a casual inspection because of the rather dramatic appearance of some very large trees lying horizontally and, indeed as might be expected, Table 1 shows that oak losses were considerably higher among the larger mature trees (27.4%).

TABLE 1. Petts Wood storm damage survey. Willett Memorial Wood: Summary Report.

Number of Sectors surveyed	48	Number of trees counted	18,507
Total hectares surveyed	33.98	Trees per hectare	545
(acres)	83.93	Number of fallen trees	5,778
Time spent on survey — hrs.	108.98	% fallen trees	31.22
Hours per hectare	3.21	% fallen or damaged trees	47.53

Tree	Total	Not damaged	Damaged	Fallen	% Fallen	% Dam. + fallen
Birch	9,647	4,206	1,351	4,090	42.40	56.40
Oak	4,091	2,465	895	731	17.87	39.75
Alder	1,540	1,273	127	140	9.09	17.34
Rowan	782	461	131	190	24.30	41.05
Sweet chestnut	764	316	180	268	35.08	58.64
Holly	657	362	163	132	20.09	44.90
Scots pine	214	132	27	55	25.70	38.32
Beech	102	69	17	16	15.69	32.35
Sycamore	87	68	11	8	9.20	21.84
Hazel	86	75	9	2	2.33	12.79
Hawthorn	84	71	6	7	8.33	15.48
Elder	77	38	22	17	22.08	50.65
Ash	76	52	16	8	10.53	31.58
Yew	55	35	15	5	9.09	9.09
Larch	51	4	2	45	88.24	92.16
Crab-apple	33	15	7	11	33.33	54.55
Sallow	33	2	13	18	54.55	93.94
Norway maple	30	16	3	11	36.67	46.67
Alder buckthorn	18	10	5	3	16.67	44.44
Hornbeam	18	10	5	3	16.67	44.44
Grey poplar	16	7	3	6	37.50	56.25
Snowy mespil	9	6	0	3	33.33	33.33
Aspen	8	5	1	2	25.00	37.50
Horse chestnut	6	4	1	1	16.67	33.33
Turkey oak	6	2	1	3	50.00	66.67
Cherry	5	1	3	1	20.00	80.00
Elm	3	1	1	1	33.33	66.67
Black poplar	2	0	2	0	0.00	100.00
Field maple	2	2	0	0	0.00	0.00
Corsican pine	1	1	0	0	0.00	0.00
Holm oak	1	1	0	0	0.00	0.00
Swedish whitebeam	1	1	0	0	0.00	0.00
Tulip-tree	1	0	0	1	100.00	100.00
Whitebeam	1	0	1	0	0.00	100.00
Mature oak	832	257	347	228	27.40	69.11

Alder, the third most abundant tree in the wood, suffered very little (9.1%). This tree is almost confined to the damp areas along the streams and hence may have been more protected by the lower level of the ground here.

Rowan, sweet chestnut and holly are the only other trees numbering more than 500 pre-storm. Among these three, damage was highest for the sweet chestnut which is now outnumbered by the less affected holly. Scots pine survived much better than the superficially similar larch with a loss level of only 25.7%. The low level of loss among beech (15.7%) may seem anomalous in view of the very heavy losses of this tree in other parts of Kent, including the London Borough of Bromley. Only one, however, of the 102 beeches in the Willett Memorial Wood is a fully mature tree (Sector 46) and the young trees survived well.

The tree that survived best was the hazel with only 2.3% loss due, no doubt, to its shrub-like, multi-stemmed growth. Other trees with less than 10% loss level were hawthorn (8.3%), yew (9.1%) and sycamore (9.2%).

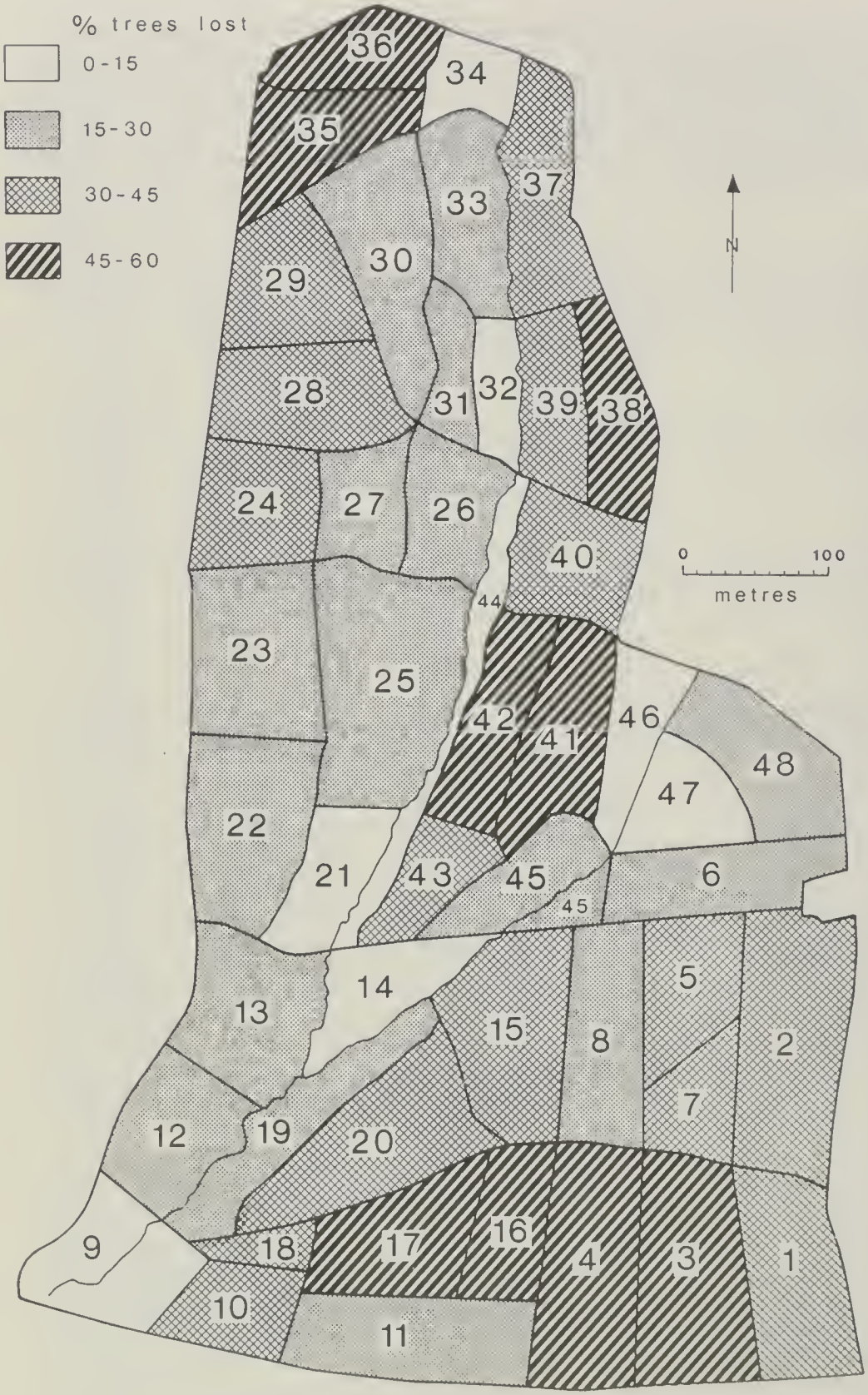


Fig. 3. Willett Memorial Wood showing storm damage at four levels by sector.

Discussion

Where the Storm Struck

Figure 3 illustrates by four shading patterns the level of damage in each of the 48 sectors. The worst-hit areas, representing greater than 45% 'fallen', are seen to be in the south close to the railway, on the east side of the stream above the rhododendron walk and in the extreme north just west of the Willett Stone. The areas of least damage, representing less than 15% fallen, all lie alongside the two streams. The highest damage levels, 58.8% fallen, occurred jointly in Sectors 41 and 36. The lowest damage level, 8.2% fallen, occurred in Sector 9 close to the railway tunnel. From these extremes it can be seen that the storm struck very unevenly. This could be due either to the course taken by the strongest wind gusts or to higher vulnerability of the trees in the worst-hit areas, or more likely a combination of the two. Without a knowledge of the wind speed required to blow over very large trees and the frequency with which this critical speed was reached during the storm it is difficult to judge how much of the diversity of damage was due to this factor. Clearly the more frequently critical gusts occurred, the more evenly spread would the damage level be.

The map (Figure 3) suggests three separate areas of wind strike, south of the rhododendron walk, east of the main stream above the rhododendron walk and in the north-west of the wood. But even within these areas certain sectors escaped lightly, due presumably to factors other than the absence of critical wind speeds. Since many of these sectors are adjacent to the streams it is likely that topographical factors or soil conditions were responsible for the added stability. Sector 44, which had a fall level of only 13.7%, is a good example. It lies immediately adjacent to Sector 42 with a fall level of 52.8%, but is one to two metres lower and has very damp soil. The dominant tree in Sector 44 is the alder which overall survived very well (9.1% fallen), but the low fall level in Sector 44 cannot be attributed to the presence of this tree since the birch which averaged 42.4% fallen overall suffered only 19.1% loss in this sector. The overall low level of alder loss seems more likely to be because it is found almost exclusively in such wet and low-lying areas of the wood where it survived not much better than other trees growing with it. Whether survival in these damp areas was due to protection from the lower level or better root anchorage in the wet soil is hard to tell since these two features are nearly always associated in the Willett Memorial Wood.

Tree Density

Figures 4 and 5 are shaded maps that show the tree density before and after the storm. Densities are expressed in trees per hectare. Overall there is a surprising variation in tree density in the wood. Pre-storm densities ranged from 168 trees/ha in Sector 5 to 959 trees/ha in Sector 31, a factor of 5.7. Typical of the low density sectors were the areas of large, mature sweet chestnut, *e.g.* as found in Sectors 2, 5 and 8, and parts of 15 and 33. The densest areas tended to be where there was a concentration of young trees as in the oak groves of Sectors 30 and 31. Pre-storm, the densest parts of the wood were concentrated in the centre and north. Figure 5 shows how the storm has reduced dramatically the overall tree density. Only one sector (number 31) remains in the highest density band at 762 trees/ha. Moreover the area of highest tree density has been shifted to west of the stream. Sectors 40, 42 and 43 have been reduced by two density bands and the whole of the area east of the stream and above the rhododendron walk is now at a density below 500 trees/ha except for Sectors 44 and 47.

Birch/Oak Ratio

Another effect of the storm has been to alter significantly the ratio of birch to oak in the wood. While birch remains the most common tree, it suffered much greater damage than oak (42.4% fallen *v.* only 17.9% for oak). Pre-storm the

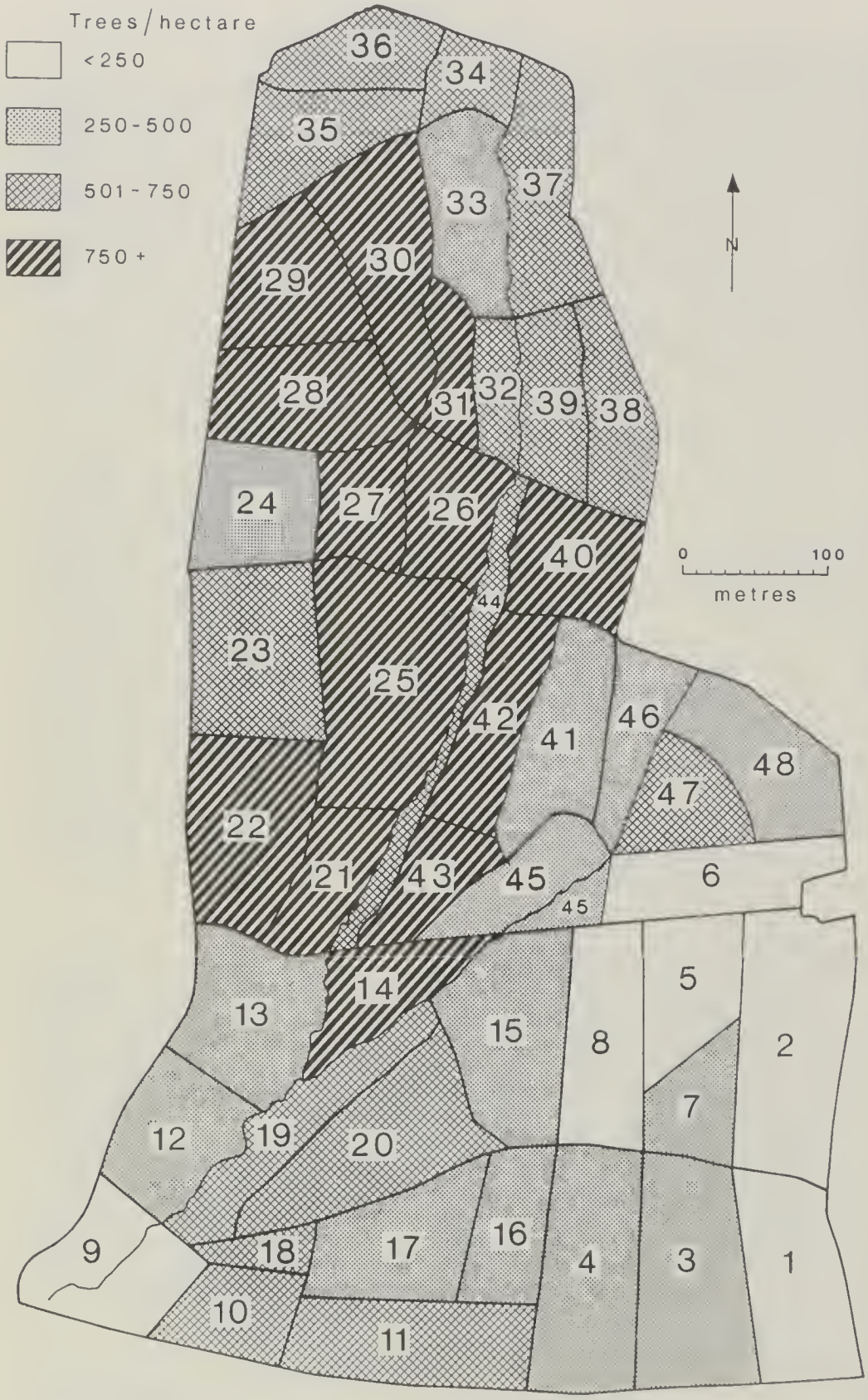


Fig. 4. Willett Memorial Wood showing tree density pre-storm.

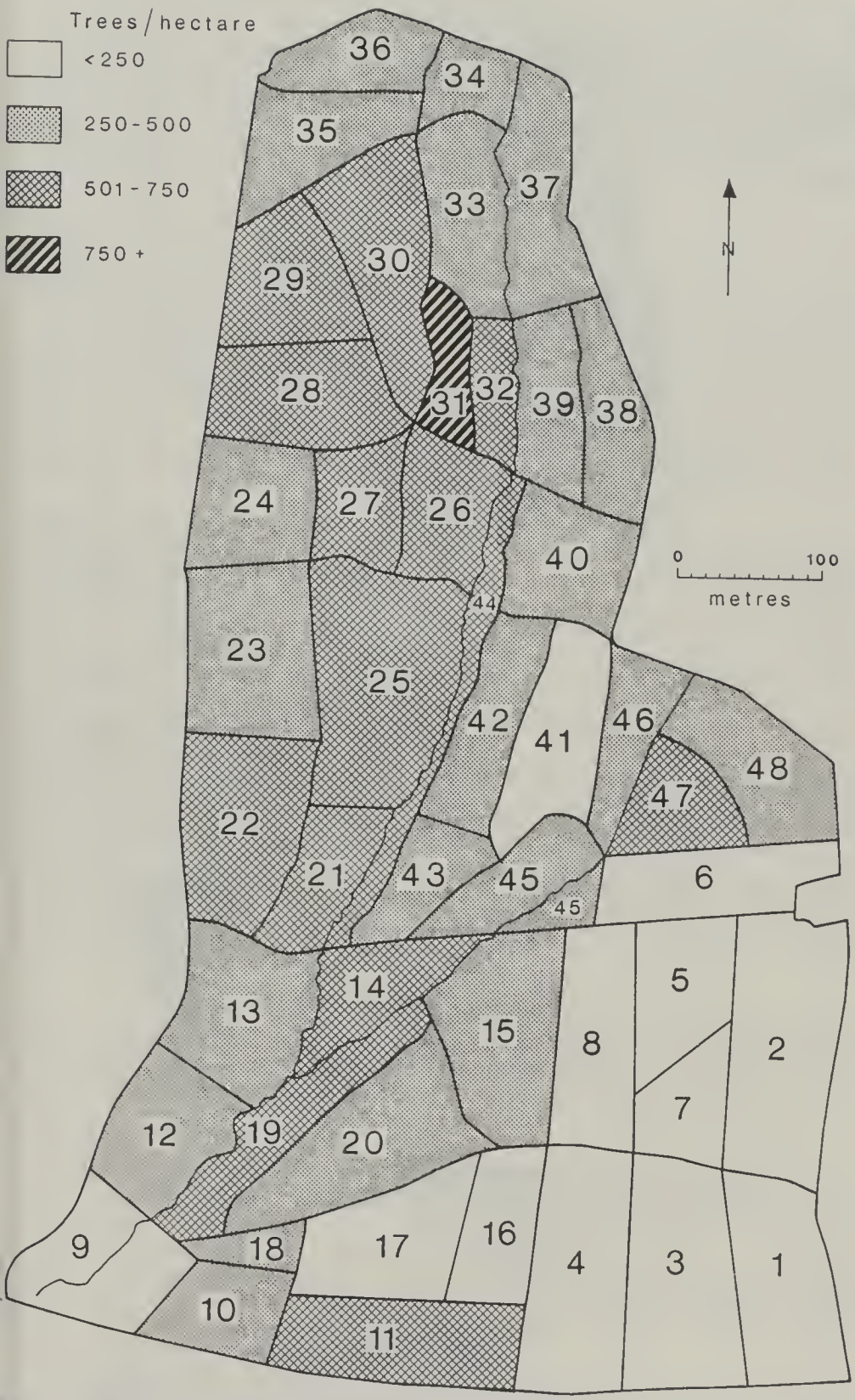


FIG. 5. Willett Memorial Wood showing tree density post-storm.

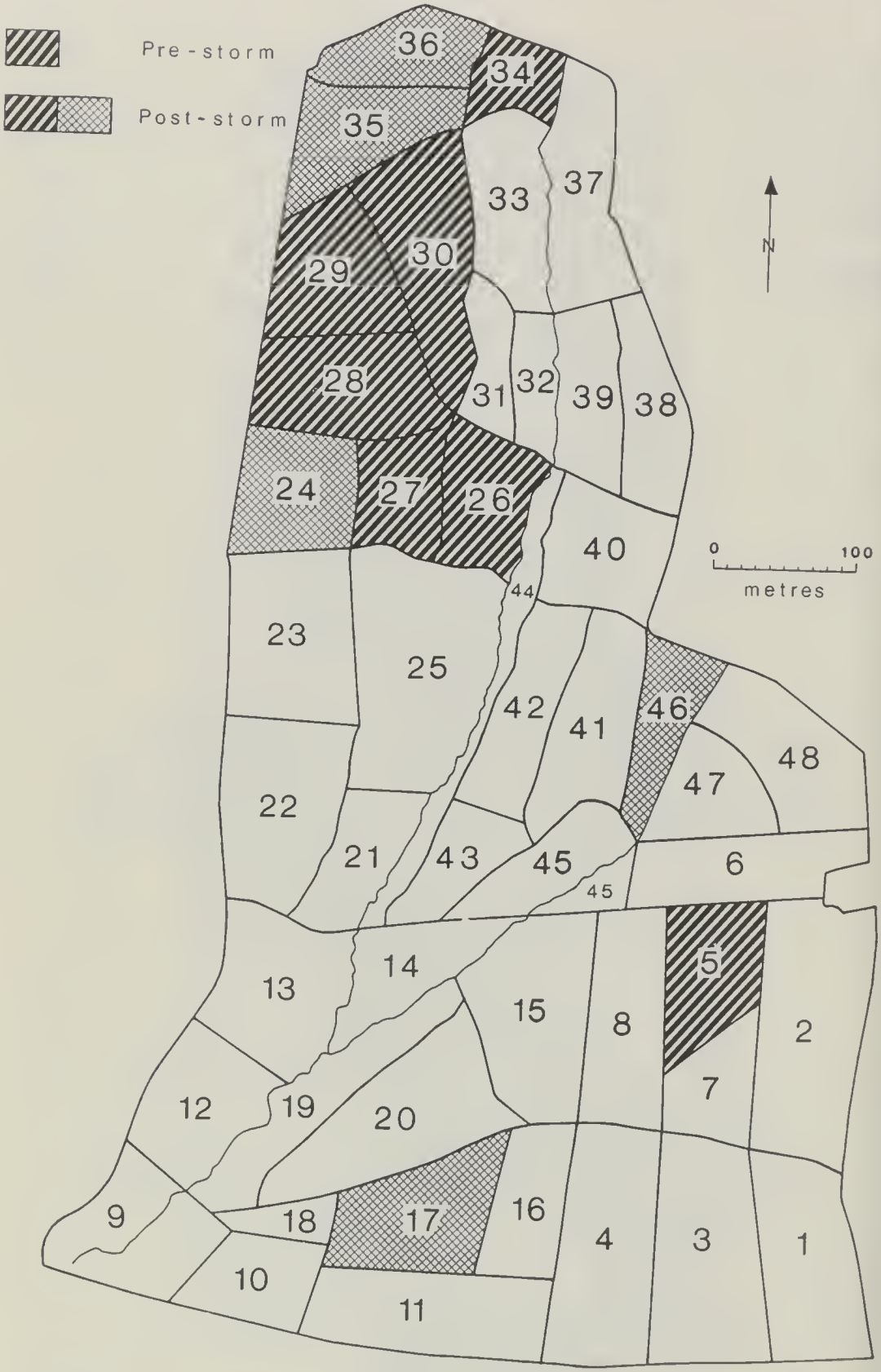


FIG. 6. Willett Memorial Wood showing sectors where oak outnumbers birch pre- and post-storm.

birch outnumbered the oak overall by a factor of 2.36:1. Post-storm this factor was reduced to 1.65:1. Figure 6 shows the sectors where oak outnumbered birch pre-storm and additional areas where oak now outnumbers birch post-storm. Based on dividing the wood into the survey sectors this is equivalent to increasing the percentage of the wood where oak predominates over birch from 12.9% to 22.6%. In a sense this is a hastening of the natural progression in an oak-wood where oak will slowly displace birch. However the more open, lower density, nature of the post-storm woodland may reverse this oak predominance by favouring, initially, birch regeneration.

Importance of a Full Survey

The uneven nature of both the storm damage and the concentration of trees in different parts of the wood lend support to the decision to survey the entire wood rather than to choose random samples. To quantify the importance of this decision predictions of the fall level and of the total trees in the wood were made after each sector survey and based on all data obtained up to that point. Thus after eight surveys the final fall level would have been predicted at about 40% and the number of trees in the wood at about 8,000 and even after 34 surveys the fall level prediction was too low at 27.9% loss though the number of trees at a prediction of 17,600 was getting closer to the true figure of 18,507.

How Accurate was the Survey?

While every reasonable precaution was taken to make the tree count as accurate as possible, inevitably some trees will have been missed and a few double-counted. Undoubtedly, counts became more accurate as experience built up and the best methods evolved. Probably the first four sectors were slightly under-recorded although later repeat counts here of one species (oak) gave results within three trees of the original counts. Accuracy also depended to some extent on tree species. Easiest to count and hence probably most accurate were the Scots pine and larch. Trees of which there were more than 500 in the wood can be expected to have a high accuracy level due to the numbers involved, whereas missing a tree for a species of which there were less than ten specimens would give a low accuracy for that species. Highest errors are probably for scarce species which were also difficult to identify without foliage — for example the *Sorbus* species (except rowan) and alder buckthorn. While these are probably less important to the results of the survey as a whole they can appear as conspicuous errors. In this respect, it is likely that not all tree species were discovered during the survey. The tulip tree in Sector 36 remained hidden until it came into leaf and was pointed out by the Warden!

Notes on the Tree Species

In the following list of trees, nomenclature and botanical sequence are based on Mitchell (1974) except for alder buckthorn and elder (not classed as trees by Mitchell). These two are included here at the end.

Common yew *Taxus baccata*

Mostly young trees and concentrated very much in the north (Sectors 35 and 36). A single old mature tree stands on the boundary bank (Sector 36).

European larch *Larix decidua*

Largest concentration in Sectors 5 and 7. Suffered more losses than any other tree — 88.2%. The only young tree was found in Sector 2. Most fallen trees produced young female bright pink cones in March.

Scots pine *Pinus sylvestris*

Seventh most common tree and suffered much less than larch. Concentrated in

two main areas, Sector 10 in the south-west and Sector 35 in the north. Together these areas held 40% of all the Scots pines.

Corsican pine *Pinus nigra* var. *maritima*

Only a single specimen in the Willett Memorial Wood which is in Sector 30 and remains undamaged. Several other Corsican pines occur in the corner of the Soldiering Field, but these are in the Hawkwood Estate. This tree, whose needles also grow in pairs like the Scots pine, has much longer needles.

Grey poplar *Populus canescens*

Of the three poplar species that occur in the wood this is the most common. They nearly all occur around the rim of the old bomb crater in Sector 22. One large specimen near the corner of the railway line and the road was a victim of the storm. In winter this species has distinct globular, two-toned buds and the vigorous display of male catkins in March on the fallen trees was a sight rarely encountered at close quarters when the trees stand upright.

Aspen *Populus tremula*

A few of this poplar grow along the railway in Sector 11. Buds are shiny brown and more pointed than in the previous species.

Black 'Italian' poplar *Populus* × *euramericana* 'Serotina'

Just two specimens of these tall poplars occur growing close together in Sector 47. Buds are very distinctive being bright red-brown and strongly pointed. Both were damaged, but remain standing.

Sallow *Salix caprea*

Also known as goat willow or pussy willow, this tree suffered the second worst loss of any in the wood (54.6%) and the highest damage level of all (93.9%). More than half those found were on dry soil near the cottage in Sector 2. Others were scattered along the course of the streams. No example of the closely related grey willow *S. cinerea* was identified, but it could possibly occur.

Silver birch *Betula pendula*

While the vast majority of birch in the wood are this species no attempt was made to distinguish other possible species, *e.g.* downy birch *B. pubescens*. Birch was by far the most abundant tree in the wood and remains so after the storm, although its predominance over oak has been reduced.

Common alder *Alnus glutinosa*

The alder is the third most common tree in the wood and predominates in the damp soil along the streams. It suffered less than 10% loss in the storm. Its pear-shaped purple buds make it an easy tree to recognise in winter.

Hornbeam *Carpinus betula*

Most of the 18 specimens in the wood were probably planted. Two very large trees in Sector 48 were blown down by the storm. This Sector, and Sector 46, holds most of the hornbeams.

Common hazel *Corylus avellana*

The hazel had the lowest loss level of any tree (2.3%). Main concentrations of hazel occur in Sectors 9, 12 and 19 along the stream near the railway tunnel and particularly in Sector 45 along the side stream just north of the rhododendron walk.

Common beech *Fagus sylvatica*

The only large mature beech is in Sector 46 near the boundary bank. This was quite badly damaged by the storm, but is still standing. Losses among the 101 young trees were low. These are mostly in the north of the wood with Sector 48 holding the largest number — 21. The smooth, grey bark and shiny, pointed buds of this tree are quite distinctive.

Sweet chestnut *Castanea sativa*

Many old, large trees are found in well-marked areas of the wood, particularly Sectors 2, 5, 7 and 8 just south of the rhododendron walk and Sectors 29, 30, 33, 34 and 35 in the extreme north. These areas of large chestnut lead to low-density woodland since not many other tree species mix with them. These large trees suffered heavy losses and even if not blown down, tended to lose large limbs making the chestnut the third most damaged tree after the sallow and larch (excluding trees with less than ten representatives). When emanating from a common root-stock, large multi-stemmed specimens were generally counted as a single tree.

Turkey oak *Quercus cerris*

This oak can be recognised by the whiskers on the winter buds and was counted separately whenever recognised. Not all oaks, however were examined carefully and it is likely that the six Turkey oaks that were found represent an underestimate of the number in the wood. A particularly large Turkey oak was blown down across the boundary bank in the north of Sector 48.

Holm oak *Quercus ilex*

A single young specimen is adjacent to the diagonal track in the south of Sector 8.

English oak *Quercus robur*

While most of the oaks in the wood are this species, no attempt was made to examine each one for the possible presence of other species such as sessile oak *Q. petraea*. Hence references to 'oak' include all species not specifically identified otherwise. This is the second most common tree in the wood after the birch and the wood as a whole can properly be referred to as an oak wood. Of the 4,091 oaks counted in the survey, 832 were mature, large trees which suffered more than the younger trees and were particularly prone to loss of large limbs. Even so overall oak losses were not high (17.9%) and 604 of the very large trees remain upright. Included among these mature trees are a number that line the boundary bank and have been pollarded. These survived better than the naturally growing large trees, but even some of these pollarded oaks were blown down.

English elm *Ulmus procera*

Only three very poor specimens were located. These were near the north-east corner of the field in Sector 35 and represent remnants of an elm hedgerow that existed along the edge of the field.

Tulip-tree *Liriodendron tulipifera*

A single tree located near the Willett Stone in Sector 36 was unfortunately uprooted by the storm.

Hawthorn *Crataegus monogyna*

Well scattered throughout the wood. Some particularly large examples in Sector 45. Survived well with second lowest loss level (8.3%) after hazel. Possibility

of closely related Midland hawthorn *C. oxyacanthoides* occurring in the wood was not investigated.

ROWAN *Sorbus aucuparia*

This fine tree occurs widely throughout the wood and remains the fourth most common species. The rather long dark purple buds with grey hairs are very distinctive. Some of the blown trees were surprisingly large. Younger ones were frequently brought down with the root plates of other trees. Although not counted in the survey several dense patches of young rowan saplings were noticed.

WHITEBEAM *Sorbus aria*

A single specimen, damaged but not lost, still stands near the northern boundary bank of Sector 36.

SWEDISH WHITEBEAM *Sorbus intermedia*

Another lone tree, this time in Sector 31, also survived the storm. More usually planted in parks and streets as, for instance, around the playing fields of nearby Hoblingwell Wood.

SNOWY MESPIL *Amelanchier laevis*

An ornamental tree doubtless introduced into the woods. Nine of these were found during the survey of which only six survived the storm. An easy-to-find example is near the main footpath between the stream bridge at the end of the rhododendron walk and the Edlmann Stone in the extreme south of Sector 22. In winter the tree has very sharp, narrow brown buds and in spring has a brief but very showy display of white flowers.

CRAB-APPLE *Malus sylvestris*

Many of the crab-apples in the wood are very old and gnarled although there are also some younger trees. They occur well scattered throughout the wood. Losses were mainly among the older trees.

WILD CHERRY *Prunus avium*

Five cherries only were found during the survey of which one was uprooted and three more damaged.

HOLLY *Ilex aquifolium*

Sixth most common tree before the storm and now fifth. Often found in multi-stemmed clumps making it difficult to get an accurate count. Some very large hollies were blown down by the storm, mostly along the boundary bank. Largest concentrations of holly were found in Sector 28 and in the extreme north (Sectors 35, 36 and 37) and all the way down the boundary bank including Sector 48.

NORWAY MAPLE *Acer platanoides*

This maple is distinguished from the more familiar sycamore by its very pointed leaves, easily found lying beneath the tree in winter. The bud is less green than in the sycamore and the bark is finely ridged. Most of the 30 specimens found were growing just north of the cottage in Sectors 6 and 48. Elsewhere there were three in Sector 31 and one in 35. The tree suffered quite heavy damage and eleven were lost.

FIELD MAPLE *Acer campestre*

Just two of these were located, one near the cottage in Sector 2 and the other

at a fork in the footpaths in Sector 20 where it joins Sectors 15 and 16. Neither was damaged.

Sycamore *Acer pseudoplatanus*

Not everybody's friend, this maple has been controlled in the woods to prevent it from taking over large areas. It seems likely to spread following the storm more than other trees unless control is continued. The 87 trees counted in the survey withstood the storm particularly well. Loss level was only 9.2%. The majority of the sycamores are in Sectors 47 and 48. Green buds aid recognition in winter.

Horse chestnut *Aesculus hippocastanum*

This well-known tree is rare in the wood and only six fairly young specimens were located, five of them near the cottage in Sectors 2 and 6 and one in Sector 37. This latter was the only one to be uprooted by the storm. Large, sticky brown buds are unmistakable as are the horseshoe marks with nail holes on the leaf scars which give the tree its name.

Common ash *Fraxinus excelsior*

Like the sycamore, the ash was another tree to survive the storm well. Only 10.5% of the 76 ash trees were lost. This may be because they tend to grow close to the streams particularly in Sectors 21, 45, 46 and 47. The very black buds make winter identification easy.

Alder buckthorn *Frangula alnus*

This and the next species only marginally qualify as trees. The alder buckthorn is valuable as a food plant for the brimstone butterfly *Gonepteryx rhamni*. Three alder buckthorns were lost in the storm. Not all survivors are in damp ground. Sectors 13, 21, 22 and 25 hold twelve while other groups are near the field in Sectors 24, 28 and 29 and east of the stream in Sectors 39 and 42. The terminal twigs of this tree tend to curve upwards and outwards, or it can be recognised by searching for an alder-like leaf still clinging to a branch in winter.

Elder *Sambucus nigra*

Another shrub-like tree, the elder suffered 22% loss often by being crushed by neighbouring falling trees. Widespread throughout the wood, the largest numbers were found in Sector 47 which contained 24 of the total of 77. This tree came into leaf in late January long before any other species.

Acknowledgements

My thanks to Peter Strangeman for his painstaking work in producing the maps which form Figures 1-6. I am grateful for botanical advice and help in tree identification from Mrs Jo Weightman and from Valerie and Peter Bailey. The Warden and Assistant Warden, Tony and Madeleine Hall, gave me encouragement and help in locating individual trees, defining wood boundaries and providing stimulating conversation around the dying embers of their fires after a day's work was completed. My thanks, also, to the many dog-walkers who showed interest in the survey and stopped to enquire about progress to date.

Reference

MITCHELL, A. 1974. *A Field Guide to the Trees of Britain and Northern Europe*. Collins, London.

Book Review

Calcareous Grasslands — Ecology and Management. Edited by S. H. Hillier, D. W. H. Walton and D. A. Wells. Bluntisham Books, Oak House, East Street, Bluntisham, Huntingdon PE17 3LS. 1990. 193 pp., A4. £10, hardbound. ISBN 1 871 99903 0.

This neatly produced volume, which is set throughout in sanserif type, was received shortly after we went to press and it is felt that the opportunity should not be lost to examine it with the minimum of delay. It covers the Proceedings of a joint British Ecological Society/Nature Conservancy Council symposium held at the University of Sheffield from 14-16 September 1987.

It is divided into five main parts: 'Calcareous Grassland — a Limited European Resource' (two papers); 'The Distinctive Features of Calcareous Grassland — Reassessed' (six papers); 'The Maintenance and Manipulation of Species Diversity' (eight papers); 'Management for Individual Species' (five papers); and 'Reserve Management' (10 papers). These are followed by details of the Posters displayed at the symposium, a short 'Summary and Conclusions', and a 'List of Participants', including amongst the 152 a fair sprinkling of familiar names, one of them a well-known member of the L.N.H.S.

The Introduction summarizes the growth of the conservation movement, and how the purchasing of sites to protect rare birds, butterflies and plants by many organizations has produced a need for clear guide-lines for site management, including the consideration of amenity and educational uses.

Many of the chapters are of immediate interest to the general naturalist, particularly as they give an up-to-date view, and all include a good selection of references among which I have noted a number for future reading. Although each paper is complete in itself, it would be wrong to suggest that any one is more important than the next — they all contribute to the overall completeness of the picture. However, several titles are possibly of more general appeal than others, whether the reader's interests be wide or specialized: 'Calcareous Grassland — a Limited Resource in Britain' provides an overall introduction and draws attention to recent surveys of the English chalk; 'Types of Calcareous Grassland' describes 14 communities in Great Britain; 'The Fauna of Calcareous Grasslands' discusses the mammals and invertebrates (insects only); 'The Mechanisms Controlling Insect Diversity in Calcareous Grasslands', 'Demographic Studies of the Perennials of Chalk Grassland' and a later paper describing 'The Case of *Ophrys sphegodes* [early spider orchid] in Chalk Grassland', a rare species with a rapidly declining distribution in the British Isles, all provide interest; 'The Conservation of Adonis Blue and Lulworth Skipper Butterflies — Two Sides of the Same Coin', relates mainly to Dorset; 'The Use of Livestock in Calcareous Grassland Management' and 'The Effect of Management on the Invertebrate Community of Calcareous Grassland' are particularly interesting, as is the short paper 'Establishing Chalk Grassland on Previously Arable Land Using Seed Mixtures'.

The aims of the joint sponsors of the symposium were to bring together researchers and managers with a particular interest in one of the most endangered habitats in the U.K. and Republic of Ireland and to provide an up-to-date review of progress in our understanding of calcareous grasslands. This they have succeeded in doing for the benefit of a wide readership at a most reasonable price. In fact, the book can be obtained at the quoted £10 **post free** direct from the publishers.

K. H. Hyatt

Hoverflies (Diptera:Syrphidae) in the London Area: Progress Report and Selected Distribution Maps

by Colin W. Plant*

Summary

This paper updates an earlier list of Diptera:Syrphidae of the London Area and assesses apparent patterns of distribution. Provisional distribution maps of selected species are presented. The current London Area hoverfly list stands at 204 species in total, of which 178 presently occur.

Introduction

A working list of the species of hoverflies known to have occurred in the London Natural History Society's recording area was produced some four years ago (Plant 1986). This was intended both as a résumé of existing data and as an indication of which species were poorly recorded. A total of 195 species was recorded, for all time, with no less than 148 of these being present in the area at the time of writing. Unfortunately, it appears that I miscounted in that work, for the true overall total of full species should have been 197! In that work, I stated that its purpose was to stimulate 'a plethora of additions to flow in my direction!' It is therefore pleasing to record that this desired effect was achieved.

The present paper summarises the progress of hoverfly recording within twenty statute miles of St Paul's Cathedral to the end of 1989, taking into account the wealth of additional data received and dividing the hoverflies into major groupings according to their apparent distribution pattern type as evidenced by the results to date. Selected distribution maps are presented for a number of species typical of each group in order to support the divisions and to demonstrate the current state of knowledge. The nomenclature employed here follows Stubbs and Falk (1983) and in accordance with editorial practice authorities for the scientific names used are, therefore, omitted.

The Current London Hoverfly List

Seven new species of hoverfly have been added to the London Area list since the 1986 paper. Six of these, *Epistrophella melanostoma* (also new to Britain), *Parasyrphus annulatus, Sphaerophoria batava, Orthonevra geniculata, Xylota florum* and *Microdon eggerii* are recorded in the post-1979 'present' period. The seventh, *Pipiza lugubris,* is an old record missed on earlier research.

From the earlier total, however, we must now delete *Cheilosia* species D and E which have been shown to be varieties of *C. proxima.* This leaves us with a total London list, for all time, of 204 species. In addition to these new species, active recording has reduced the list of species for which, in 1986, there were no recent records, to 26 at the start of 1990, leaving us with a total list of 178 species recorded during the post-1979 current period — a total of which all who have contributed so far should feel justly proud!

As far as the future is concerned there can be no doubt that extra species will be added and, hopefully, species thought extinct here refound. The current interest in the genus *Platycheirus* and to a lesser extent in *Sphaerophoria* is likely to pay dividends. Speight and Goeldlin (1990) have recently demonstrated that the *Platycheirus clypeatus* aggregate comprises no fewer than twelve species in Europe and add three species, *P. europaeus, P. occultus* and *P. ramsarensis,* to the British Isles list, whilst Speight and Vockeroth (1988) have earlier added *P.*

*Passmore Edwards Museum, Romford Road, Stratford, London E15 4LZ.
Address for records: 14 West Road, Bishop's Stortford, Hertfordshire CM23 3QP.

amplus — a species until now confused with *P. peltatus*. Of these additions, at least *P. occultus* will almost certainly be found amongst existing series of *angustatus/clypeatus* specimens and all existing London Area records of *P. angustatus* and *P. clypeatus* ought really to be disregarded until the voucher specimens are re-examined.

In due course it is proposed to publish the results of hoverfly recording in full; in the meantime however, partly to stimulate even more records, and partly to reward those who have already contributed, the list is now analysed and selected distribution maps are presented. **[See Editor's Note on p. 00].**

Distribution Groupings of London Hoverflies

It is possible, combining examination of the maps with the data on the record cards, to divide the hoverflies into thirteen groups. These now follow.

Group 1. Species which appear to be widespread and common throughout the whole of the London Area (Maps 1 & 2)

These are the species whose distribution pattern sets a background against which others can be interpreted for, by virtue of their omnipresence, they reflect, in most cases, the pattern of coverage achieved. The two maps show a resident species, *Platycheirus albimanus*, and a resident which is also a partial immigrant, *Episyrphus balteatus*.

The full list of species falling into this category is as follows:

Melanostoma mellinum, scalare
Platycheirus ambiguus, albimanus, clypeatus, manicatus, peltatus, scutatus
Chrysotoxum bicinctum, festivum
Dasysyrphus albostriatus, venustus
Epistrophe eligans, grossulariae
Episyrphus balteatus
Leucozona lucorum
Meliscaeva auricollis, cinctella
Metasyrphus corollae, luniger
Sphaerophoria scripta
Syrphus ribesii, vitripennis
Cheilosia albitarsis, paganus, vernalis
Rhingia campestris
Neoascia podagrica
Eristalis arbustorum, intricarius, nemorum, pertinax, tenax
Helophilus pendulus
Myathropa florea
Eumerus tuberculatus
Merodon equestris
Pipiza noctiluca
Pipizella varipes
Volucella bombylans, inanis, zonaria
Syritta pipiens
Xylota segnis

Group 2. Species which appear to be widespread in a wide range of habitats across the London Area, but with a scattered distribution, being absent from a number of apparently suitable areas (Maps 3-6)

This is an interesting group, and one whose members may change in the fullness of time. They reflect species which are quite numerically common in the region but whose distribution is clearly restricted by habitat, food or other factors. Unlike the species in Group 1, these flies would not normally be expected in back gardens, for example, in anywhere other than a truly rural setting. The maps selected show the distributions of *Paragus haemorrhous, Chrysotoxum cautum, Melangyna labiatarum* and *Cheilosia scutellata* as being fairly representative. The full list comprises:

Paragus haemorrhous
Chrysotoxum cautum, verralli
Dasysyrphus tricinctus
Melangyna labiatarum
Parasyrphus punctulatus
Xanthogramma pedisequum
Cheilosia proxima, scutellata
Heringia heringi
Pipiza austriaca
Pipizella virens

Group 3. Widespread species likely to occur in most broadleaved woodlands in the London Area (Maps 7-9)

These species would be in Group 1 were they not confined to woodlands. It seems that most woodlands will suffice, even secondary sycamore copses. I have chosen to show *Baccha obscuripennis sensu stricto, Syrphus torvus* and *Ferdinandia cuprea*. The full list comprises:

Baccha elongata, obscuripennis
Platycheirus tarsalis
Syrphus torvus
Cheilosia variabilis
Ferdinandia cuprea
Xylota sylvarum

Group 4. Relatively widespread hoverflies which are confined to the older broadleaved woodlands (Maps 10-12)

Not unexpectedly, these hoverflies are all acknowledged indicators of ancient woodland (woodland which has persisted on the same site without being clear-felled since at least A.D. 1600). Naturally, not all ancient woodlands will possess the same indicator species, but present evidence suggests however, that most of the qualifying woods in our area should produce at least some of these nine given adequate survey. Maps are shown here for *Rhingia rostrata, Volucella inflata* and *Chalcosyrphus nemorum*. The full list is:

Portevinia maculata
Rhingia rostrata
Brachyopa insensilis, scutellaris
Spliegina kimacowiczi
Volucella inflata
Brachypalpoides lenta
Chalcosyrphus nemorum
Criorhina berberina

Group 5. Widespread species likely to appear in most damp habitats across the London Area (Maps 13-15)

Again, like Group 3, these species escape inclusion in Group 1, this time because of their requirement for an aquatic or damp habitat to complete their life-cycle. Excluded from this list are such species as *Eristalis pertinax* which qualifies for Group 1 in spite of its aquatic associations because of its propensity for wandering into drier areas. The maps show known distributions of *Platycheirus angustatus, Cheilosia hirtella* and *Eristalinus sepulchralis*. The full list comprises:

Platycheirus angustatus, fulviventris
Chrysogaster hirtella, solstitialis
Lejogaster metallina
Neoascia tenur
Orthonevra splendens
Anasimyia lineata
Eristalinus sepulchralis
Eristalis horticola

Group 6. Species not qualifying for Group 5, but which are likely to appear in the larger/older damp habitats in the London Area (Maps 16-18)

A fairly self-explanatory category, though it is not always clear why some of the species I have decided to include here should not be as widespread as those in Group 5. I have mapped *Pyrophaena granditarsa, Metasyrphus latifasciatus* and *Helophilus hybridus*. The list consists of:

Pyrophaena granditarsa, rosarum (woods)
Metasyrphus latifasciatus
Anasimyia contracta
Helophilus hybridus, trivittatus
Parhelophilus frutetorum, versicolor

Group 7. Species apparently confined to the chalk of the North Downs (Map 19)

The three *Microdon* species each only just affect our area in the extreme south-west. However, the map for *Cheilosia soror* shows the line of the Downs quite clearly. There are six species involved as follows:

Cheilosia barbata, vulpina, soror
Microdon devius, eggeri, mutabilis

Group 8. Species clearly far more abundant and widespread in the south or south-west of the London Area, but not necessarily on chalk (Maps 20 & 21)

Quite why these species should be southern or south-western is unclear. In the case of *Sphaerophoria* under-recording may be partly to blame, but this is most certainly not the case for the two *Leucozona* species, which have been searched for assiduously in Essex over several years. I have mapped *Leucozona glaucia* and *Cheilosia illustrata* as being fairly representative. The full list reads:

Epistrophe diaphana
Leucozona glaucia, laternaria
Sphaerophoria menthastri, taeniata
Cheilosia bergenstammi, illustrata, impressa
Sericomyia silentis

Group 9. Species with a distribution restricted to within a few kilometres of the River Thames (Map 22)

This is a quite short list of species. *Anasimyia interpuncta* must be regarded as a great rarity, but the map for *Sphaerophoria rueppellii* speaks for the remainder as well. The four are:

Sphaerophoria rueppellii
Anasimyia interpuncta
Triglyphus primus
Tropidia scita

Group 10. Species which occur solely as immigrants in the London Area

Early immigrants may breed, but there are apparently no over-winter survivors. This Group involves a single species, which is not mapped since the distribution of records is governed by chance immigration rather than by any strict habitat or other local ecological factors.

Scaeva pyrastri

Group 11. Flies for which there are still only a few records, but sufficient data to suggest that the species are under-recorded rather than rare (Maps 23-25)

This is a difficult category, and there is obviously a degree of educated guesswork in segregating the species in this Group from those in Group 12 below. The list should be read with this in mind, though in most cases the inclusion of the fly here is likely to be justified. There is no uniformity of pattern, so maps

of three species, *Melangyna triangulifera, Cheilosia grossa* and *Neoascia interrupta* are selected to display the range. In all, eleven species are involved as follows:

Melangyna compositarum, lasiophthalma, quadrimaculata, umbellatarum
Meligramma cincta, triangulifera
Xanthogramma citrofasciatum
Cheilosia grossa
Neoascia interrupta, meticulosa
Neocnemodon vitripennis

Group 12. Flies for which there are so few records that no pattern of distribution has yet emerged

Many of these species are likely to be genuinely rare in the London Area as a whole, though where they do occur they may sometimes be locally numerous. Several species are identified by Stubbs (1982) as being ancient woodland indicators and these are annotated 'AWI' in the list. Others are possibly indicators of wetland habitats (Whiteley 1987) and are annotated with the word 'WET'. There seems little point in reproducing any of the maps here. The species are as follows:

Platycheirus discimanus (AWI), *immarginatus* (WET), *scambus* (WET)
Xanthandrus comtus
Chrysotoxum elegans
Dasysyrphus lunulatus
Doros conopseus
Didea fasciata (AWI)
Epistrophe nitidicollis (AWI)
Epistrophella euchroma (AWI), *melanostoma*
Meligramma guttata (AWI)
Metasyrphus latilunulatus, nitens (AWI)
Scaeva selenitica
Parasyrphus annulatus, vittiger
Sphaerophoria batava
Cheilosia albipila, carbonaria (AWI), *fraterna, honesta, mutabilis, nigripes, praecox, velutina*
Brachyopa pilosa (AWI)
Chrysogaster chalybeata (WET), *macquarti, virescens* (WET)
Lejogaster splendida
Myolepta luteola (AWI)
Neoascia geniculata (WET)
Orthonevra brevicornis (WET), *geniculata* (WET), *nobilis* (WET)
Sphegina clunipes (AWI), *verecunda* (AWI)
Anasimyia transfuga (WET)
Parhelophilus consimilis
Eristalinus aeneus
Eristalis abusivus (WET)
Mallota cimbiciformis (AWI)
Eumerus ornatus
Psilota anthracina (AWI)
Pipiza bimaculata, fenestrata, luteitarsis (AWI)
Brachypalpus laphriformis (AWI)
Criorhina asilica (AWI), *floccosa* (AWI), *ranunculi* (AWI)
Xylota abiens (AWI), *xanthocnema* (AWI), *florum* (AWI)

Group 13. Flies for which there are no recent records and which are therefore presumed absent from the London Area

These are all hoverflies which have not been recorded after 31 December 1979 and they number 26 species. No maps are presented here. The full list is as follows:

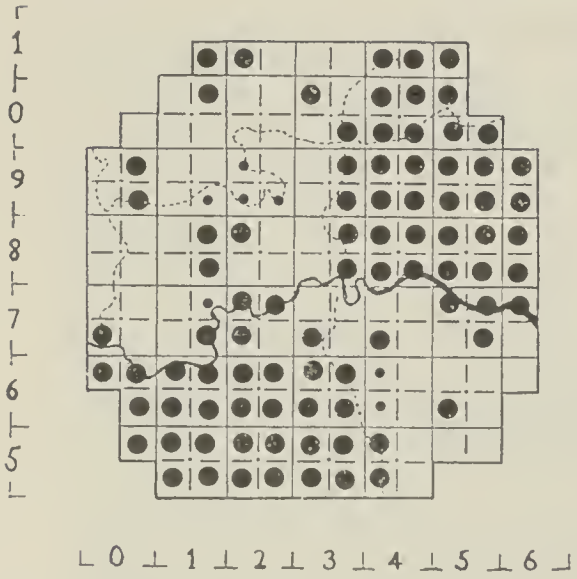
Platycheirys sticticus
Chrysotoxum octomaculatum

Didea alneti, intermedia
Melangyna barbifrons
Parasyrphus lineola
Sphaerophoria loewii
Callicera aenea
Cheilosia antiqua, chrysocoma, cynocephala, intonsa, longula, nebulosa, semifasciata
Ferdinandia ruficornis
Brachyopa bicolor
Neoascia obliqua
Lejops vittata
Eumerus strigatus
Neocnemodon brevidens, latitarsis
Pipiza lugubris
Arctophila fulva
Pocota personata
Xylota tarda

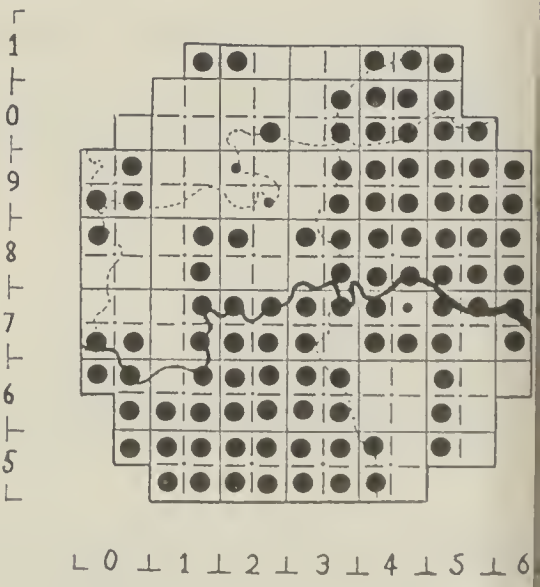
The Maps

The twenty-five maps which follow show the presently known distributions of the species indicated within the London Natural History Society recording area. The ten-kilometre square references of the National Grid are indicated in the left and lower margins and the smaller squares on the maps are each 5 × 5 kilometres. A dot in a square indicates the presence of the species in that square but is no indication of frequency or abundance. Large dots indicate a record made in the period 1 January 1980 to 31 December 1989; small dots indicate a record made prior to this period. For clarity, the maps show also the River Thames and, as dotted lines, the Vice-County boundaries.

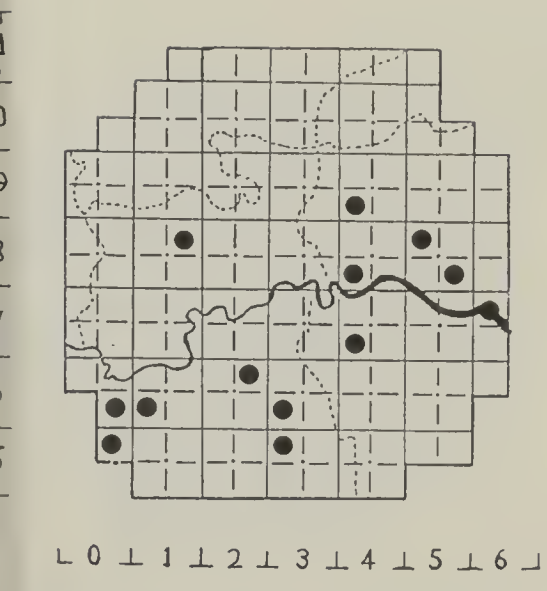
[Editor's Note: Readers will notice, however, that the maps are smaller than the Society's standard distribution maps and overlays. As these maps show the distribution of species selected as typical for the Groups being discussed, it is felt justified to reproduce them at a smaller size in this Progress Report].



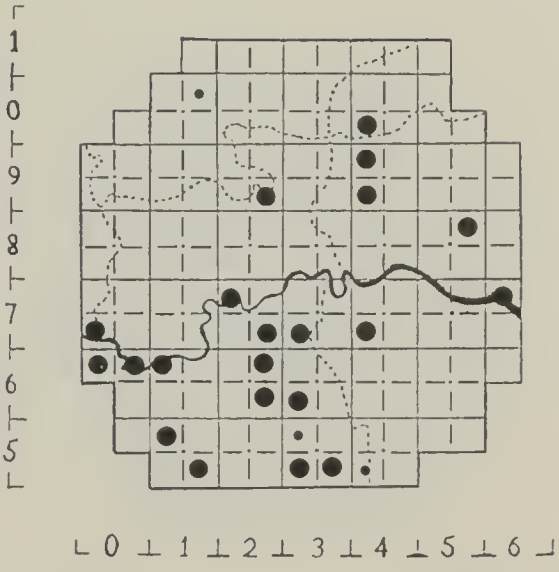
Map 1. *Platycheirus albimanus* (Group 1).



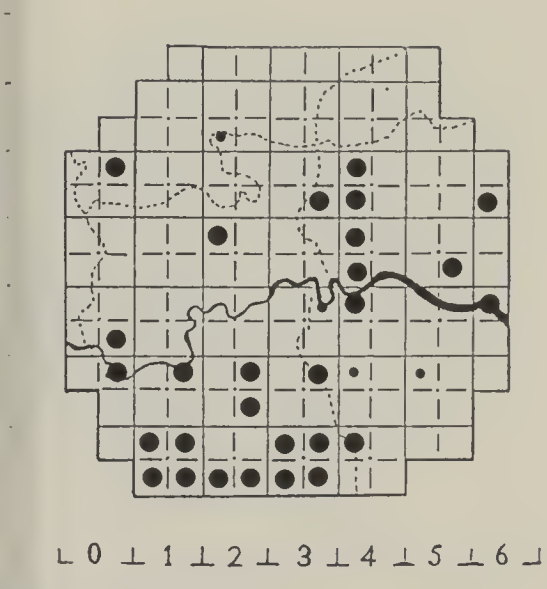
Map 2. *Eipsyrphus balteatus* (Group 1).



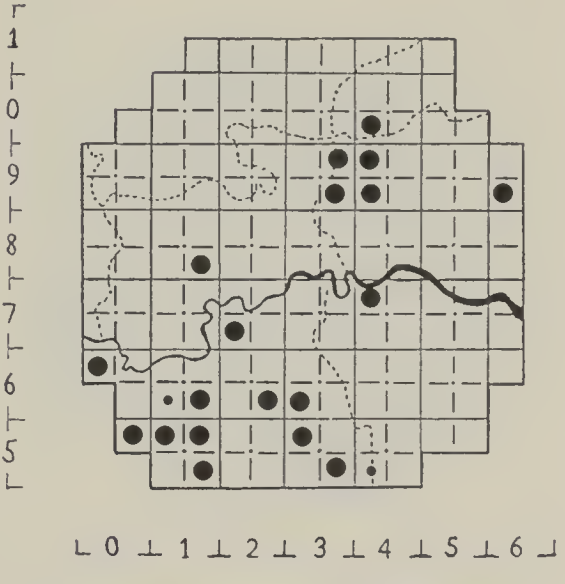
MAP 3. *Paragus haemorrhous* (Group 2).



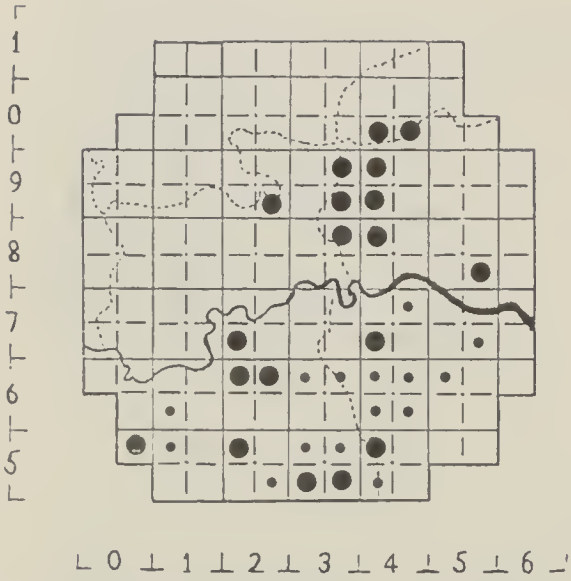
MAP 4. *Chrysotoxum cautum* (Group 2).



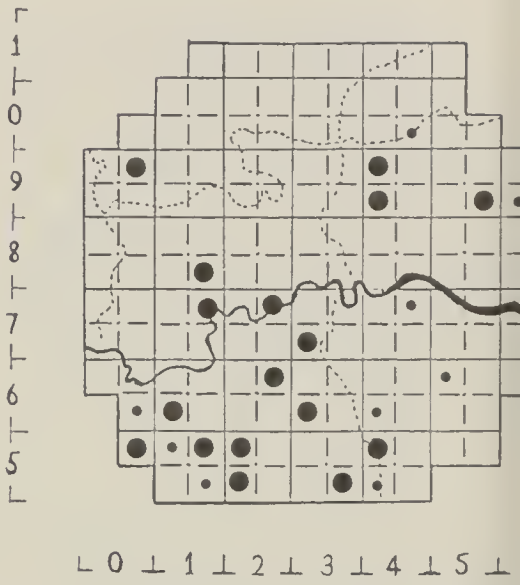
MAP 5. *Melangyna labiatarum* (Group 2).



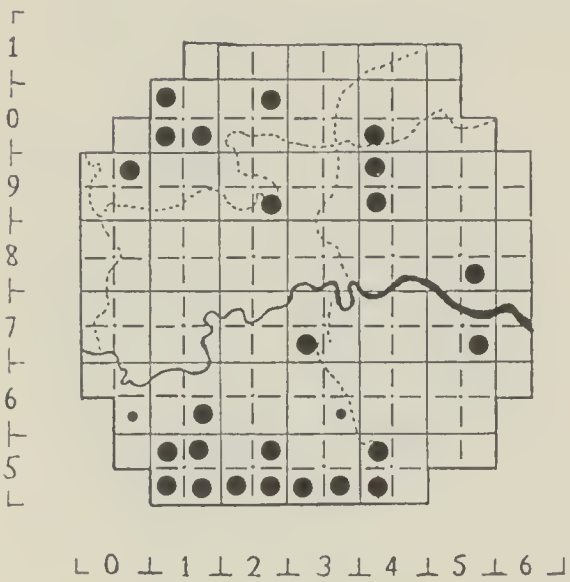
MAP 6. *Cheilosia scutellata* (Group 2).



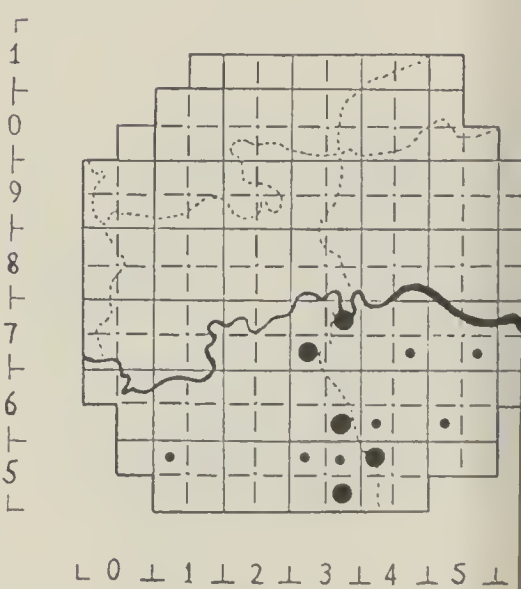
MAP 7. *Baccha obscuripennis* — males only (Group 3).



MAP 8. *Syrphus torvus* (Group 3).

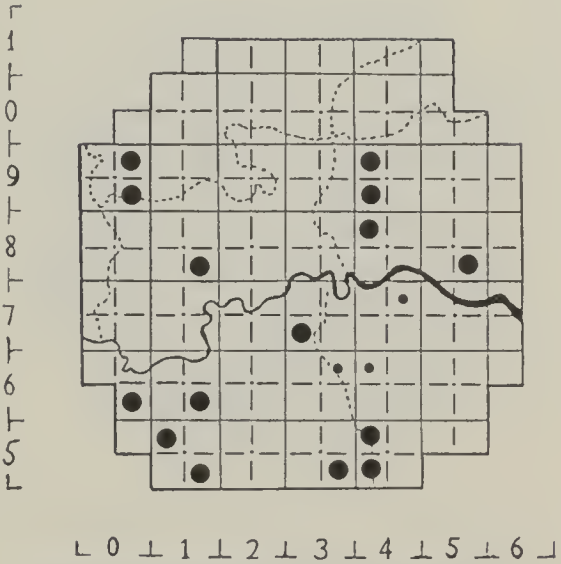


MAP 9. *Ferdinandia cuprea* (Group 3).



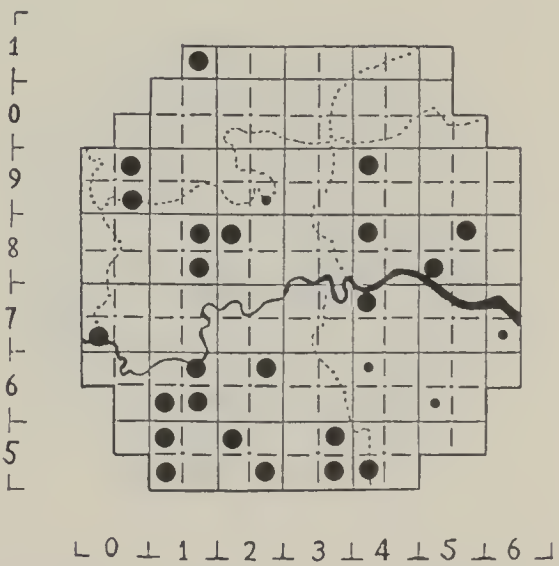
MAP 10. *Rhingia rostrata* (Group 4).

MAP 11. *Volucella inflata* (Group 4).

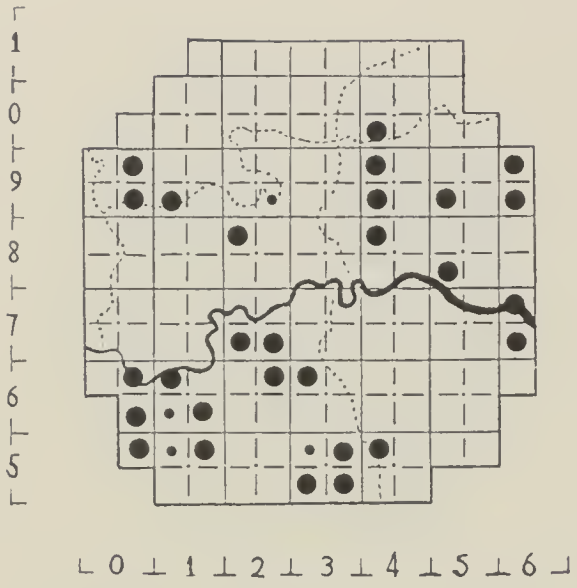


MAP 12. *Chalcosyrphus nemorum* (Group 4).

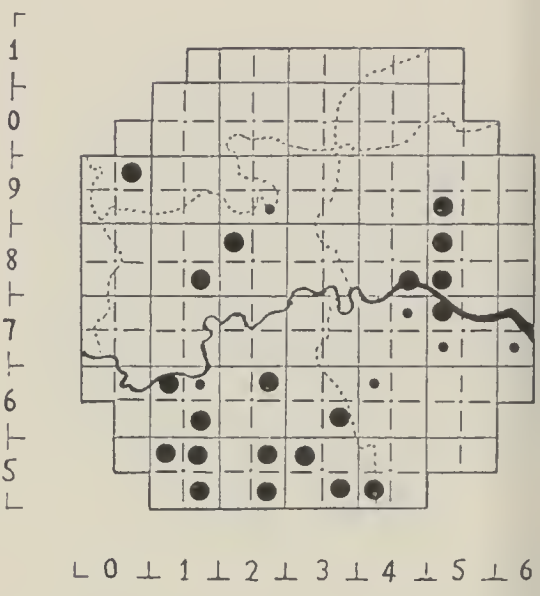
MAP 13. *Platycheirus angustatus* (Group 5).



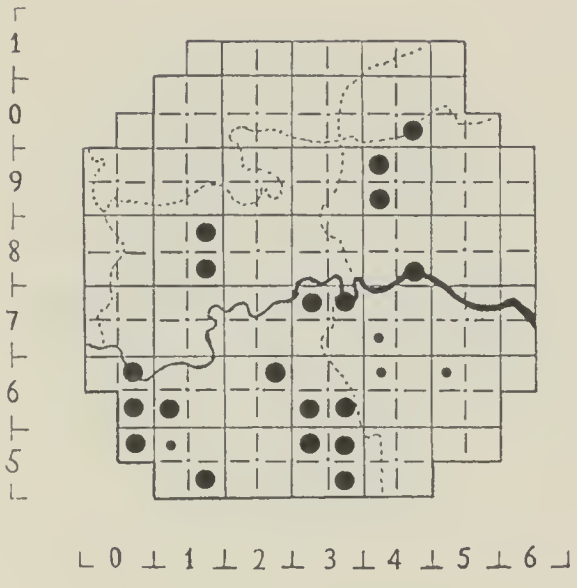
MAP 14. *Chrysogaster hirtella* (Group 5).



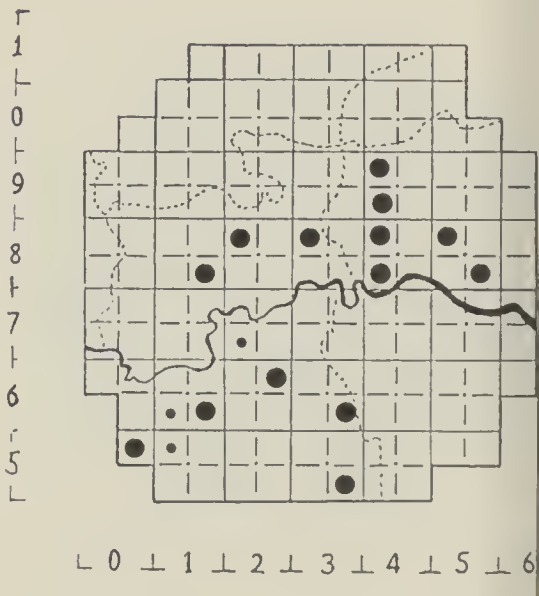
Map 15. *Eristalinus sepulchralis* (Group 5).



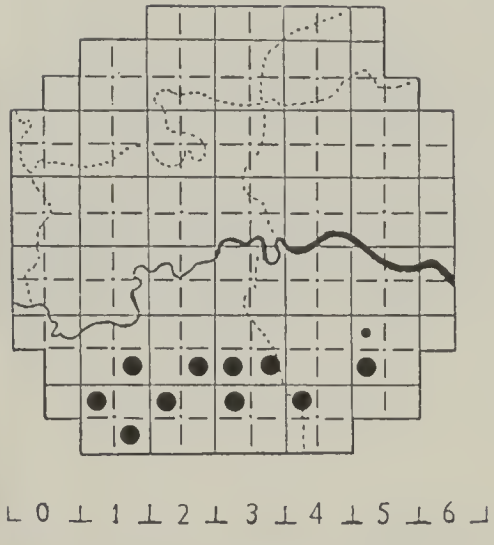
Map 16. *Pyrophaena granditarsa* (Group 6).



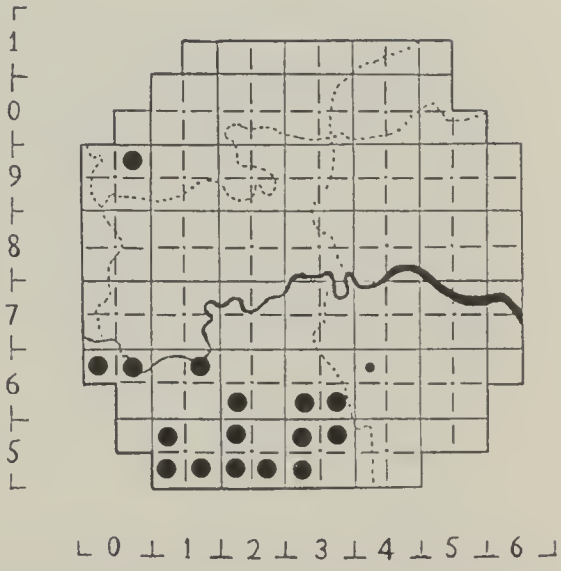
Map 17. *Metasyrphus latifasciatus* (Group 6).



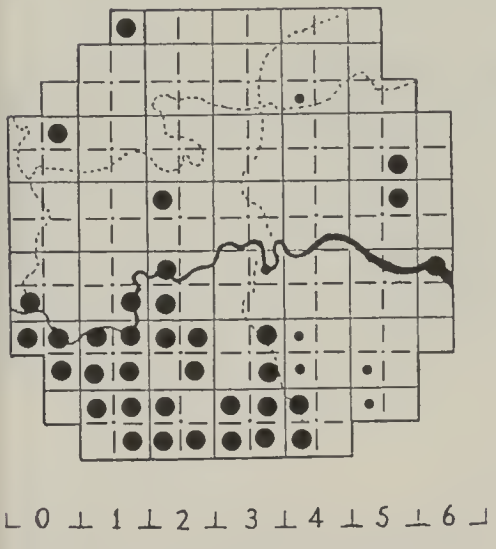
Map 18. *Helophilus hybridus* (Group 6).



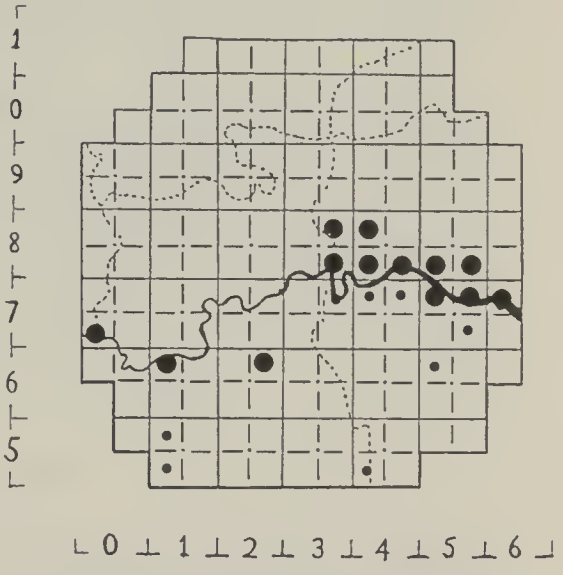
MAP 19. *Cheilosia soror* (Group 7).



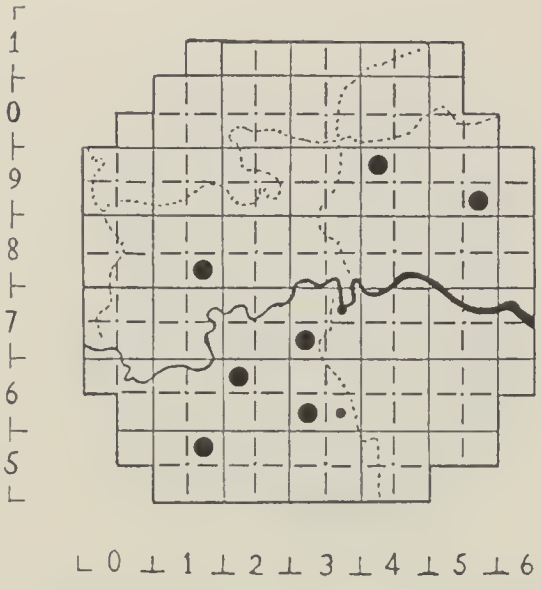
MAP 20. *Leucozona glaucia* (Group 8).



MAP 21. *Cheilosia illustrata* (Group 8).

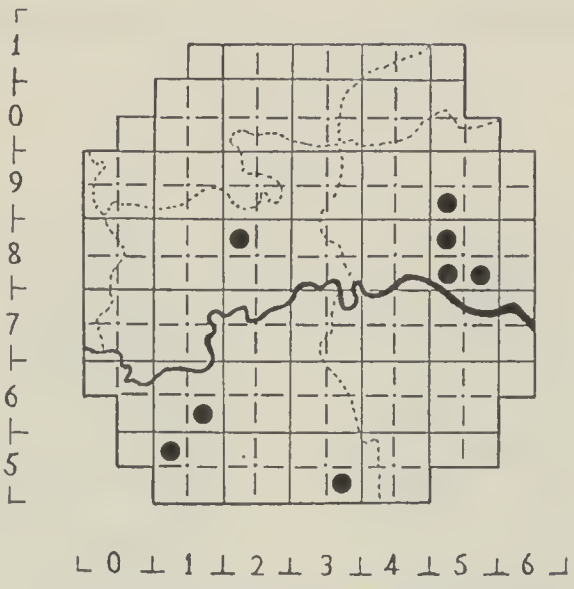


MAP 22. *Sphaerophoria rueppellii* (Group 9).



Map 23. *Melangyna triangulifera* (Group 11).

Map 24. *Cheilosia grossa* (Group 11).



Map 25. *Neoascia interrupta* (Group 11).

Discussion

The list of hoverflies is by no means complete, since it is likely, on past experience, that additional species will be found, old records updated and much added to our knowledge of distributions. Sadly, there is still a great deal which science does not comprehend concerning the behaviour, biology and habitat requirements of these fascinating insects. The use of invertebrates as monitors of environmental factors is a relatively recent innovation and thus is an area where the amateur is able to make a major contribution. Only by pooling all available knowledge can an overall assessment be made of any parameter, and we are still some way off assessing properly the value of hoverflies as environmental indicators in an urban region such as Greater London. Time, and the continuing assistance of amateur entomologists, will tell — one hopes.

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Book Review

The Greenhouse Effect and Terrestrial Ecosystems of the UK. Edited by M. G. R. Cannell and M. D. Hooper. I.T.E. Reserch Publication No. 4. H.M.S.O. 1990. 56 pp., A4. £4.95. ISBN 0 11 701488 5.

This publication is larger and less expensive than Nos 1 and 3 in the same series and reviewed on these pages last year. It is probably expected to, and hopefully will, sell in very large numbers. If we are to continue as a civilized, developing planet we must understand fully our effect on the environment. Pollution of the atmosphere and the seas has been taking place for longer than we have reliable data, but already much of the world is aware of the need to clean up.

In its five sections and 12 short chapters (each by specialist authors), it sets out to put into perspective the facts and predictions relating to the now familiar 'greenhouse effect'. The intention is to alert us – all of us – to the uncertainties that lie ahead. If we wait and see, it will be too late to respond. The present warming of the earth is happening at a quicker rate than did any of the past climatic changes, so there is no parallel from which to make comparisons. The sections are 'The Greenhouse Gases', 'Effects on Soils', 'Effects on Plants', 'Effects on Animals', which include invertebrates, birds and mammals, and 'Effects on Ecosystems', which includes plant communities and coastal habitats.

In my view well worth purchasing and essential reading for all concerned with the environment and the future of our flora and fauna.

K. H. Hyatt

Book Review

Whales, Dolphins and Porpoises. Fourteen contributors. Consulting editors, Sir Richard Harrison and Dr M. M. Bryden. Merehurst Press, London, 1988. 240 pp. £16.95. ISBN 1 85391 034 1.

This book is in the same series as *Sharks* which I have already had the opportunity of reviewing. It has been produced with the same excellence which was the hallmark of its predecessor, and is topical in view of the concern caused by the canine distemper virus affecting seals, which has jumped the species barrier to kill porpoises and dolphins with the real risk of spreading to other Cetacea. Many of these marine mammals are, as we already know, under threat, therefore a book giving so much cetacean information so concisely is very opportune.

There are fourteen expert contributors, and the book deals systematically with the evolution and fossil record of the cetaceans and their numerous varied extant families. The opening chapter concerning evolution contains many surprising indications of likely ancestry, together with most interesting reconstructions of the remains in the fossil record.

The pages dealing with 'Kinds of Whales' inform the reader that cetaceans are divided into two suborders, Mysticeti or baleen whales and Odontoceti or toothed whales. The fine illustrations depict in fascinating detail the varied, and sometimes extraordinary, shapes of these mighty mammals of the deep. Details of appearance, size, habitat and distribution, reproduction and diet, are given under these headings individually for each species.

The differences between baleen and toothed whales are discussed in later chapters along with a full account of their distribution and ecology. Also, information is given regarding parasites.

Under the section entitled 'The World of the Whale' come separate chapters on anatomy, adaptation to aquatic environment, senses, reproduction and development, social behaviour and intelligence.

The third section is headed 'Whales and People' and goes into detail concerning whales in art and literature and the many historical, mythological and artistic references to the animals are recorded, including the biblical story of Jonah, the Dolphin of Jassos, and Moby Dick. This section will delight readers interested in history and folk-lore. Inevitably in this section comes the 'History of Whaling' which contains many accounts of our reprehensible behaviour towards these animals through the ages. Following this is a chapter on cetaceans in captivity and how the dolphinariums have created a public awareness of these creatures, which is of course a prerequisite of conservation control. Captivity has also enabled research to be carried out and scientific data to be collected. There are some delightful pictures and accounts of human contact under the chapter by that name, and the chapter dealing with 'Strandings – Fact and Fiction', gives accounts of these events and the theories of the causes. Advice of what to do if you encounter a stranding is given in these pages.

This fine book is brought to a close with a checklist of living whales, a bibliography, a useful metric conversion table and a comprehensive index. The whole is beautifully illustrated, and many fine photographs are to be found throughout its pages. The reviewer has no hesitation in recommending this book which appeals to him not only as a mammalogist, but also as a palaeontologist, and it will certainly appeal to all naturalists and to the public at large – a fitting companion to the one on sharks from the same stable.

R. V. Goulding

A Working List of the Larger Brachycera (Diptera) of the London Area

by Colin W. Plant*

Summary

This account deals with the true flies (Diptera) of the ten families Stratiomyidae, Xylomiidae, Xylophagidae, Rhagionidae, Tabanidae, Asilidae, Therevidae, Scenopinidae, Acroceridae and Bombyliidae known collectively as the Larger Brachycera. The two remaining families of the British Brachycera, Empididae and Dolichopodidae, are traditionally, though artificially, separated and may be the subject of a later 'working list'. All species known to occur, or which have in the past occurred, in the London Area, a circle of radius twenty miles centred upon St Paul's Cathedral, are listed and discussed briefly. The list is intended partly as a stimulus for further recording work in the area.

Introduction

After the hoverflies (Syrphidae), the families of the larger Brachycera are probably amongst the better recorded of British Diptera, though even within this group some families are better worked than others. A 'working list' of hoverflies in the same geographical area has already been produced (Plant 1986) and has stimulated a deal of interest in this interesting group. It is hoped that this attempt to summarise all known records of the larger Brachycera in the London Area will provoke a similar response from dipterists and all records are welcomed at the address below. All records received are forwarded automatically to the National Scheme organiser under the name of the original recorder.

Sources of Records

Records of London Brachycera have come from a wide range of sources. The records of several individual dipterists have been the principal source of recent records. Since 1976, there has been in existence a 'Larger Brachycera Recording Scheme', run under the auspices of the Institute of Terrestrial Ecology's Environmental Information Centre (formerly the Biological Records Centre), at Monks Wood in Cambridgeshire. This has stimulated, through a useful *Newsletter,* much interest in the group. Records from this scheme have been accessed and are now on the Society's recording cards. Much assistance has also been forthcoming from the current organiser of the scheme, Martin Drake, to whom the author is most grateful. Further records have been gleaned from the files of the three Essex Biological Records Centres at Passmore Edwards, Southend-on-Sea and Colchester Museums, as well as from the Essex Field Club's County Recorder for the Diptera. The files of the biological archive at Maidstone Museum were not searched for the present list since it is known that records are not kept there for the portion of vice-county 16 that falls within the Greater London region. It is likely that some records have been missed, though these gaps will hopefully be filled in due course. A rather superficial search of the literature has revealed further records and the reader's attention is drawn to two particularly important papers on the larger Brachycera, for the Watford area from 1985 to 1988 (Godfrey 1989) and for the Epping Forest Area (Hanson 1985).

Larger Brachycera in the London Natural History Society's Recording Area

All species for which the Society has a record are listed. In the case of apparently rarer species I have listed all the available records. However, for

*Passmore Edwards Museum, Romford Road, Stratford, London E15 4LZ.
Address for records: 14 West Road, Bishop's Stortford, Hertfordshire CM23 3QP.

many of the more common insects this would be impractical in a paper of this nature and a general summary is given. All species are annotated with the span of the years for which records are available and for the flight period as observed in the London Area. Rarer species are also annotated with the categories of the Invertebrate *Red Data Book* into which they fall (Ball 1986, Shirt 1987). It has not been possible to verify all of the records gleaned from the literature or received from the Environmental Information Centre and the list should be read with this fact in mind.

In view of recent taxonomic advances made in this group, especially in the Stratiomyidae, it is essential that authorities and synonyms are included.

STRATIOMYIDAE (Soldier flies)
In the London Area 36 out of the British total of 49 are recorded as follows:

Beridinae

Beris chalybata (Forster) (= *chalybeata* Forster) — 1894 to 1989: 25.v to 21.ix.
Widespread and fairly common, including urban areas, though apparently absent from the central region.

B. clavies (L.) — *Red Data Book* category 'Notable' — 1921 to 1987: 20.v to 29.vi.
Apparently rare, with only six records as follows: Eltham, 6.vi.1921; Mickleham, 1950; Harlow, 1963; Watford, 13.vi.1964; Withy Beds, Watford, 29.vi.1986; and Limpsfield Chart, 20.v.1987.

B. geniculata Curtis — 1948 to 1986: 30.vi to 19.viii.
Apparently rare. Five records as follows: Muswell Hill Scout Camp, 8.viii.1948; Sudbury Hill, 30.vi.1982; Roding Valley, Loughton, 1983; Coppets Wood, 14.vii.1984; and Brent Reservoir, 19.viii.1986.

B. morrisii Dale — 1933 to 1985: 13.v to 19.viii.
Widespread but apparently local, with only eleven records available from Surrey, West Kent, Middlesex and Herts.

B. vallata (Forster) — 1957 to 1989: 27.vi to 6.viii.
Widespread and common, though largely absent from the 'built-up' area.

Chorisops nagatomii Rozkosny — *Red Data Book* category 'Notable' — 1951 to 1985 17.viii to 8.ix.
The fourth British record was made at Banstead on 2.ix.1951, the earlier records being Dorset in 1941, Shepwick in 1947 and the New Forest in 1897 (Roskosny 1979): this specimen is in the British Museum (Natural History). Since then there have been seven records: at Wanstead Park and Carshalton Beeches in 1980, Shooters Hill, Blackheath and Hither Green in 1984, and Leytonstone and Loughton in 1985.

C. tibialis (Mg.) — 1933 to 1988: 15.vii to 19.viii.
Probably widespread and fairly common, though there are no records at all from the urban areas. It would be surprising not to find this fly in at least the larger gardens of London.

Nemotelus nigrinus Fallen — *Red Data Book* category 'Notable' — 1909 to 1987: 18.v to 27.vii.
Evidently local and rare. All records are given: Thames Marshes in Kent at TQ47 on 3.vii.1909, 18.v.1912 and 11.vii.1927; Eastbrookend, Dagenham on 6.vii.1984; Pix Farm, near Watford on 27.vii.1986 and Colney Heath on 20.vi.1987.

N. notatus (Zell.) — *Red Data Book* category 'Notable' — 1902 to 1984: 11.vii to 22.vii.
Evidently very rare and confined to the Thames estuary area, from whence originate all other records for vice-counties 16 to 21 and 24 sent to the national recording scheme. There are three older records for Gravesend Marshes in 1902 (possibly outside our area), Abbey Wood in 1905 and the Thames marshes in grid square TQ47 in 1908. Since then there is but a single record — that of one swept from roadside verges at Tilbury on 12.vii.1984.

N. uliginosus (L.) — 1902 to 1984: 20.vi to 26.vii.
Like the preceding species, apparently rare and confined to the Thames estuary area. Recorded on the Kent marshes from 1905 to 1935 it has only been noted since then from the dense reedbeds at Ingrebourne Marshes in 1984 and at Eastbrookend, Dagenham, in the same year.

Clitellaria ephippium (Fabr.) — ?1850 only.
Oldroyd (1969) says 'No authoritatively British specimens exist, but the B.M. has five, four from the Stephens Collection and one fine female labelled by F. W. Edwards: "Locality unknown, possibly Darenth Woods, about 1850. coll. by W. Marshall (see F. C. Adams' notebook)".'

Oxycera analis Mg. — 1956 only: 3.vii.
The record in Oldroyd (1969) for Eynsford relates to an example taken there on 3.vii.1956 by Andrewes. This is our only record.

O. morrisii Curtis — 1979 to 1986: 3.vii to 20.vii.
Two records only: Charlton, a male on 20.vii.1979 and Pix Farm Gravel Pit, near Watford, a female swept from *Typha* on 3.vii.1986.

O. nigricornis Olivier (= *formosa* Mg.) — *Red Data Book* category 'Notable' — 1968 to 1986: 21.vii to 27.viii.
Evidently very local. Pond Wood (TQ 4469) on 30.vi.1968; Charlton, 28.vii.1980 and Cassiobury Park, not infrequent from 21.vii-27.viii.1986. Allen (1981) comments that this species is apparently absent from the 'well worked Thames Marshes area'.

O. rara Scop. (= *pulchella* Mg.) — *Red Data Book* category 'Notable' — 1947 to 1986: 28.vi to 10.viii.
Rather few records, all widely spaced in Herts, Middlesex and South Essex.

O. trilineata (Fabr.) — *Red Data Book* category 'Notable' — 1904 to 1986: 26.vi to 22.viii.
Widespread but very local, mostly along the Thames in West Kent and South Essex, but with single records for Watford, Muswell Hill and Syon Park.

Vanoyia tenuicornis (Macq.) — 1946 to 1986: 21.vi to 10.viii.
The widely spread records indicate that it is very local and confined to marsh areas with *Phragmites*. However, wherever it occurs it seems to be fairly numerous.

Pachygastrinae

Pachygaster atra (Panzer) — 1924 to 1989: 10.vi to 7.viii.
Widespread and frequently abundant.

Praomyia leachii (Curtis) — 1930 to 1989: 18.vi to 21.ix.
Widespread and frequently abundant.

Neopachygaster meromelaena (Dufour) — *Red Data Book* category 'Notable' — *c.*1960 to 1983: 25.vi to 3.viii.
Four records: Abbey Wood (TQ47), post 1960; Stanmore, 25.vi.1981; Ruislip Woods, 1982; and Barn Hill, 3.viii.1983. Elsewhere in vice-counties 16 to 21 and 24, there are only three records — for SU98, TQ05 and TQ55. All three border our area.

Eupachygaster tarsalis (Zell.) — *Red Data Book* category 'Notable' — 1898 only: 18.vi.
Single record, from Blackheath on 18.vi.1898. The specimen is in the B.M.(N.H.).

Sarginae

Chloromyia formosa (Scopoli) — 1902 to 1989: 21.v to 19.viii.
Widespread and common.

Microchrysa cyaneiventris (Zell.) — 1985 to 1986: 29.vi to 20.vii.
Two records, from Cuckoo Wood, Downe on 20.vii 1985 and Withy Beds, Watford on 29.vi.1986.

M. flavicornis Mg. — 1937 to 1984: 11.vi to 24.vii.
Rather local and scarce. Recorded along the North Downs, in South Essex and a single record from Enfield.

M. polita (L.) — 1904 to 1986: 10.v to 25.xi.
Widespread and common.

Sargus bipunctatus (Scop.) — 1939 to 1985: [17.v] 28.viii to 3.xi.
Widespread, but uncommon in woods and gardens. The date of 17 May (*vide* Godfrey 1989), is exceptionally early and stands out from the other 43 records available all of which fall after 28 August.

S. cuprarius (L.) — *Red Data Book* category 'Notable' — 1902 to 1948: 18.iv to 22.vii.
Only three records, from Eltham in 1902, Bexley in 1914 and Muswell Hill Scout Park in 1948. Apart from one at Wisley there are no other records for vice-counties 16 to 21 and 24 and this species is possibly extinct in the London Area. Stubbs (pers. comm.) states that there are few authentic records of this species in Britain and that most

specimens under that name are in reality *flavipes*. These three records should be treated with great caution.

S. flavipes (Mg.) (= *splendens* Mg. = *minimus* Zell.) — 1918 to 1983: 30.vii to 16.ix.
Only eight records (discounting the three *cuprarius* records above which perhaps ought to be included here), all in the south-west sector from Bromley round to Runnymede. Only three of the records were made in the last twenty years, at Harefield, Runnymede and Denham.

S. iridatus (Scop.) — 1901 to 1985: 19.v to 19.viii.
Local and scarce, preferring older woodlands.

Stratiomyinae

Odontomyia argentata (Fabr.) — *Red Data Book* category 'Vulnerable' — 1948 only: 2.v to 8.v.
Three records, Bookham, 2.v.1948, Erith, 8.v.1948 and Stanmore, undated record via Environmental Information Centre.

O. ornata (Mg.) — *Red Data Book* category 'Vulnerable' — 1894 to 1953.
Oldroyd (1969) gives 'south-eastern England: Kent, Middlesex, Sussex, Surrey' whilst Shirt (1987) lists Byfleet, Acton, Mitcham and Stanmore. In Britain the fly is now confined to Somerset.

O. tigrina (Fabr.) — *Red Data Book* category 'Notable' — 1893 to 1985: 17.v to 22.vi.
Formerly widespread but local, this species may have declined. Recent records are from Epping Forest, Stanmore and Cassiobury Park.

Oplodontha viridula (Fabr.) — *Red Data Book* category 'Notable' — 1905 to 1984: 30.vi to 4.viii.
Local and scarce, with few recent records.

S. furcata (Fabr.) (= *singularior* (Harris)) — 1905 to 1985: 1.vii to 8.viii.
Very local and very scarce. Only five records since 1960.

S. longicornis (Scop.) — *Red Data Book* category 'Vulnerable' — 1896 to 1901: 22.v to 14.vii.
Very local and scarce. In Britain the fly occurs only along the coast from East Anglia to Hampshire.

S. potamida (Mg.) – 1938 to 1985: 13.vi to 20.viii.
Widespread in marshes and damp woods, though usually single examples only are reported. Possibly increasing.

XYLOMIIDAE

Two of the three British species are recorded.

Solva maculata (Mg.) — No dates available.
Old records are available from Finchley and Epping Forest, but it appears that this rare fly may no longer occur in the London Area.

S. marginata (Mg.) — 1935 to 1985: 8.ii to 27.vii.
Widespread but not uncommon where it occurs. Though probably a rare fly, it is likely to prove under-recorded.

XYLOPHAGIDAE

Only one of the three British species is recorded.

Xylophagus ater Mg. — 1987 only: 20.v.
Extremely local, known only from The Chart and immediate area, south-east of Westerham, on both sides of the L.N.H.S. boundary line, where at least six separate examples were taken in May 1987.

RHAGIONIDAE (Snipe flies)

The London Area records seven species from a British total of 18.

Chrysopilus asiliformis (Mg.) (= *aureus* Mg.) — 1909 to 1986: 19.vi to 16.viii.
Locally abundant in widely separated areas well away from urban development.

C. cristatus (Fabr.) — 1902 to 1987: 29.v to 9.viii.
Like the previous species, this one is often abundant where it occurs, but is present only in widely scattered sites in the rural zone.

Symphoromyia immaculata (Mg.) — 1981 to 1987: 29.v to 30.vi.
Very local and scarce. Only two records — Roding Valley, 1981 and Colney Heath, 1987 — are away from the North Downs.

Rhagio lineolus Fabr. — 1907 to 1986: 11.vi to 21.ix.
Widespread and common in suitable habitat. There is a definite peak of activity from late June to mid-July.

R. scolopaceus (L.) — 1963 to 1989: 20.v to 2.vii.
Widespread and common in suitable habitat.

R. strigosus (Mg.) — 1954 to 1981: 15.vi to 29.vii.
First recorded as British from Happy Valley, Box Hill on 29.vii.1954. All subsequent records are from this immediate area.

R. tringarius (L.) (including *nigriventris* Loew) — 1908 to 1987: 20.v to 18.viii.
Widespread but local, and rarely found in numbers.

TABANIDAE (Horse-flies or clegs)

Sixteen of the 29 British species have been recorded from the London Area.

Chrysopinae

Chrysops caecutiens (L.) — 1905 to 1986: 11.vi to 18.viii.
Frequent in strictly rural areas, but absent from all 'built up' regions.

C. relictus Mg. — 1902 to 1984: 2.vi to 6.ix.
Frequent in strictly rural areas, but absent from all 'built up' regions.

C. viduatus Fabr. (= *pictus* Mg.) — *Red Data Book* category 'Notable' — 1984 only: 10.vii.
A single record: Eastbrookend, Dagenham, 10.vii.1984.

Tabaninae

Haematopota crassicornis Wahl. — 1947 to 1985: 7.vi to 16.vii.
Local and rare. Recorded from Muswell Hill, 1947; Westerham, 1977; Barn Hill and the Brent Reservoir, 1983; and Whippendell Wood, 1985.

H. grandis Mg. (= *italica* Mg.) — 1904 to 1927: 30.vii to 30.vii.
Two records only: Abbey Wood (now the site of Thamesmead) 1904 and the nearby Thames Marshes in 1927. Probably now extinct in the London Area.

H. pluvialis (L.) — 1904 to 1985: 6.vi to 31.vii.
Formerly widespread, but appears to have retreated in advance of urbanisation.

Atylotus fulvus (Mg.) — *Red Data Book* eategory 'Notable' — 1931 only: 2.viii.
A single record: Byfleet, 2.viii.1931.

Hybomitra bimaculata (Macq.) — 1924 to 1970: 16.v to 8.viii.
Formerly widespread in a ring around the urban area, there are no records since the one at Dagnam Park, Romford in 1970.

H. ciureai (Séguy) (= *schineri* Lyneborg) — 1946 to 1970: 3.viii to 3.viii.
Known only from the Brentwood area in 1946 and from nearby Dagnam Park, Romford in 1970.

H. distinguenda (Verrall) — 1930 to 1947: 20.vi to 31.vii.
Noted only from Westerham in 1930, Northaw Great Wood in 1946 and Byfleet, Bookham and Oxshott in 1947.

Tabanus autumnalis L. — 1870 to 1960: 30.v to 18.vii.
Only ten records are available, all relating to quiet rural areas. This is equally true of the first record — from Lewisham in 1870. This area was a quiet farming community at that period in history!

T. bovinus L./*sudeticus* Zell. — 1958 only: no flight data.
There is a single record in the files of the National Recording Scheme, from Whippendell Wood in 1958, under the heading *'T. bovinus'*. Martin Drake has commented that there is considerable confusion over this species and that there is only one genuine specimen — from the New Forest. All other records are suspect and may well be *sudeticus,* though even this is interesting because *sudeticus* is a fairly western species.

T. bromius L. — 1931 to 1977: 28.vi to 21.viii.
Apart from Brentwood in 1946, Bricket Wood in 1947 and 1950, and Whippendell Wood in 1954, all records herald from the vicinity of the North Downs in Surrey.

T. glaucopis Mg. — 1946 only: 11.viii.
Oldroyd (1969) lists Box Hill and Eynsford without dates. The Environmental Information Centre at Monks Wood also records Bookham Common on 11.viii.1946.

T. maculicornis Zell. — 1909 to 1959: 5.vi to 12.vii.
Only two localities are recorded: Weybridge in 1909 and Byfleet in 1931, 1946 and 1959.

T. sudeticus Zell. (= *verralli* Oldroyd) — *Red Data Book* category 'Notable' — 1901 to 1924: 9.vii to 5.viii.
Two records only: Chertsey, 5.viii.1901 and Oxshott, 9.vii.1924. See comments under *T. bovinus* above.

ASILIDAE (Robber flies)
A total of seventeen species out of the British total of twenty-five are recorded for the London Area.

Asilus crabroniformis L. — 1926 to 1980: 3.viii to 27.viii.
Local and scarce around the outer edge of the London Area. There is a single record from the urban area at Hyde Park (Parmenter 1959).

Dysmachus trigonus (Mg.) — 1924 to 1984: 27.vi to 5.vii.
Parmenter (1952) regarded this fly as being 'another London asilid. It can be found nearer in than *crabroniformis*. I know ... Mitcham Common ...'. An examination of Parmenter (1959), dates this to approximately 1947. However, the available records do not bear out our former President's statement, with Farningham, St Paul's Cray and Oxshott being the only other localities.

Epiptriptus cingulatus (Fabr.) — *Red Data Book* category 'Notable' — 1910 to 1988: 19.iv to 14.viii.
The wide span of dates includes an example taken at Thorndon Park on 19.iv.1988 reported as *'Machimus cingulatus'*. Apart from this there are only seven records of this uncommon species, falling between 3.viii and 14.viii.

Eutolmus rufibarbis (Mg.) — *Red Data Book* category 'Vulnerable' — 1872 to 1949: 29.vi to 3.viii.
A scarce fly with only Farningham, Egham, Weybridge and Byfleet listed at which localities it is now almost certainly extinct. The fly requires large blocks of dry heathland as its primary habitat.

Machimus atricapillus (Fall.) — 1934 to 1985: 22.vii to 21.x.
A fairly widespread and common insect in suitable habitat in the London Area.

Neoitamus cyanurus (Loew) — 1901 to 1985: 8.vi to 13.x.
Frequent in woods, usually in association with bracken *Pteridium aquilinum.*

Laphria gilva (L.) — *Red Data Book* category 'Endangered' — 1946 only: 24.vii.
A single record: Oxshott, 24.vii.1946, when a pair were captured *in copula.* Elsewhere in Britain it was recorded from Windsor Forest in 1938 and at Silchester, Hampshire in 1946. It has not been otherwise recorded in this country.

L. marginata (L.) — *Red Data Book* category 'Notable' – 1916 to 1962: 13.v to 2.ix.
Scarce, with only thirteen records, none of which is recent.

Leptogaster cylindrica (Degeer) — 1902 to 1984: 11.vi to 7.viii.
Widespread and frequent away from the 'built-up' areas.

L. guttiventris Zell. — *Red Data Book* category 'Notable' — 1908 to 1966: 20.vi to 30.vii.
Only five records are available: Bexley and Darenth in 1908; Farningham in 1926; Eynsford in 1935 and Fetcham Downs in 1966.

Dioctria atricapilla Mg. — 1918 to 1986: 10.v to 11.vii.
Widespread and often common.

D. baumhaueri Mg. — 1900 to 1985: 30.v to 2.viii.
Widespread and often common.

D. cothurnata Mg. — *Red Data Book* category 'Notable' — 1895 only: 6.vii.
A single record, from Oxshott on 6.vii.1895.

D. linearis (Fabr.) — 1909 to 1985: 26.v to 29.viii.
Widespread and often abundant. The most frequently encountered asilid in the London Area.

D. oelandica (L.) — *Red Data Book* category 'Notable' — 1921 to 1985: 21.v to 29.vi.
Local and apparently rare, with only nine records available.

D. rufipes (Degeer) — 1907 to 1988: 18.v to 24.vii.
Widespread and very common, coming closer into town than other asilids.

Leptarthrus brevirostris (Mg.) — *Red Data Book* category 'Notable' — 1892 to 1971: 31.v to 8.ix.
Formerly quite widespread along the North Downs in Kent and Surrey, but with no recent records.

Lasiopogon cinctus (Fabr.) — *Red Data Book* category 'Notable' — 1900 to 1952: 8.v to 1.vi.
Recorded from Oxshott in 1900, Esher in 1938 and 1947 and Egham in 1952. Possibly extinct in the London Area. The nearest records appear to be from Cambridgeshire and near Guildford, in Surrey.

THEREVIDAE (Stiletto flies)

A total of six of the 13 British species are recorded for the London Area. Therevids are difficult flies to identify and all old records may need careful checking. The following data are, therefore, rather provisional.

Psilocephala melaleuca (Loew) — *Red Data Book* category 'Endangered' — 1980.
Greenwich Park — a larva in 1980. There are very few other British records.

Thereva annulata Fabr. — 1984: no flight data.
A single record from a garden in London N.12, adjacent to Coppet's Wood Nature Reserve.

T. bipunctata Mg. — 1935 to 1961: 17.vi to 21.vii.
Recorded from Oxshott, Mitcham, Wimbledon, Hampstead and Cripplegate.

T. fulva (Mg.) — *Red Data Book* category 'Notable' — 1868 to 1934: 7.v to 15.viii.
A total of twelve records in all, every one being in Kent and Surrey.

T. lunulata Zell. — 1985: vii.
A single record is available of one taken at Ingrebourne Marsh in July 1985.

T. nobilitata (Fabr.) — 1901 to 1984: 19.vi to 14.viii.
The few records indicate this species to be widespread and overlooked.

T. plebeia (L.) — 1898 to 1986: 15.v to 17.vii.
Widespread, but probably overlooked in many areas.

SCENOPINIDAE (Window flies)

Two of the three British species are recorded.

Scenopinus fenestralis (L.) — 1927 to 1989: 18.vi to 1.ix.
Widespread and very common. This fly is known as the window fly because it is in such an indoor habitat that it is usually recorded. It is the most frequent member of the Brachycera in the urban area of London and indeed is more often found here than in the rural region.

S. glabrifrons Mg. — *Red Data Book* category 'Notable' — 1931: 28.x.
There is a single record of a female bred from a larva found in a Persian carpet on 28.x.1931. The specimen is in the B.M.(N.H.) and the label reads 'London'.

ACROCERIDAE
All three British species are recorded for the London Area. The family is, however, grossly under-recorded.

Acrocera orbicula Fabr. (= *globulus* Panzer) — 1910 to 1986: 30.vii to 13.viii.
Recorded from Bushy Park, Richmond Park and Shoreham, but doubtless overlooked elsewhere.

Ogcodes gibbosus (L.) — *Red Data Book* category 'Notable' — 1835 to 1950: 24.vi to 8.vii.
Recorded only from Ashtead, Richmond Park, Wimbledon Common and Edgware.

O. pallipes Latr. — *Red Data Book* category 'Notable' — 1939 to 1985: 26.vi to 26.vii.
Twelve records from twelve localities indicate that this fly is possibly overlooked in many places.

BOMBYLIIDAE (Bee-flies)
Four of the ten British species are noted for the London Area.

Bombylius discolor Mikan — *Red Data Book* category 'Notable' — 1930 to 1976: 25.iv to 1.vi.
Apparently rare, noted only from Bookham and Limpsfield Commons, Eynsford and West Kingsdown. The species is probably missed because of its early flight period.

B. major L. — 1938 to 1989: 24.iii to 26.v.
A widespread and very common fly of the early spring, often the first insect to be noticed on the wing by the casual observer. Restricted to woods and larger, established gardens with trees.

Thyridanthrax fenestratus (Fall.) — 1931 to 1946: 31.v to 24.vii.
Recorded only from Byfleet in 1944 and Oxshott in 1931 and 1946, this fly is almost certainly now absent from the London Area.

Villa paniscus Verrall, *nec* Rossi (= *modesta* (Mg.)) — *Red Data Book* category 'Notable' — 1950 to 1982: 12.vi to 26.vii.
Recorded from Epping Forest in 1950 and 1975 and from Ruislip Woods S.S.S.I. in 1982. Possibly overlooked elsewhere in older woodlands.

Analysis

Family	Total recorded for London Area	Total of British species	% of British species recorded
Stratiomyidae	36	49	74
Xylomiidae	2	3	66
Xylophagidae	1	3	33
Rhagionidae	7	18	39
Tabanidae	16	29	55
Asilidae	17	25	68
Therevidae	7	13	54
Scenopinidae	2	3	66
Acroceridae	3	3	100
Bombyliidae	4	10	40
All families	**95**	**156**	**61**

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Book Review

The Greatest Glasshouse. The Rainforests Recreated. By Sue Minter. With contributions by Chris Jones, Peter Morris and Peter Riddington. HMSO, London, for the Royal Botanic Gardens, Kew. 1990. 216 pp., A4 (approx.), Many illustrations in colour and black and white. £25. ISBN 0 11 250035 8.

For many generations of Londoners one of the most famous and popular paces to visit has been Kew Gardens, situated within very easy reach of the metropolis. And within the Gardens one of the most popular attractions has been, since 1848, the Palm House. Over the years this masterpiece of iron and glass has suffered the ravages of two world wars, London smog, high humidity, violent storms, and more recently, overcrowding. Renovation work was carried out in the 1950s, but deterioration continued and it was realized that a full-scale restoration was necessary.

In 1984 the Palm House was, for the first time in its history, completely emptied of its plants. Many of the specimens were transferred to a temporary greenhouse and many of which could be propagated had had propagules taken for over a year beforehand so that the parent plants could be discarded. Sadly, some of the largest specimens had to be felled, but interestingly, the 'oldest pot plant in the world', a specimen of the South African cycad *Encephalartos altensteinii,* was moved out for the first time since 1848 – and returned on completion of the work.

Concurrent with the restoration work plans were made for planting for the twenty-first century. The theme proposed was to plant the house as one habitat and the clue is in the book's subtitle, the tropical rainforests of the three continents, with America in the centre, Africa in the south wing and Asia with Australia and the Pacific in the north wing. The restoration work was completed in November 1988, the return of the plants commenced the following spring and was completed by the autumn, and the Palm House was reopened to the public on 1 December 1989. In his Foreword, Kew's Director states that 'It will be a hundred years before the Palm House needs refurbishing and a hundred years is longer than the tropical forests will last unless their destruction is slowed or halted'.

There is more in this book than just the mechanics of dismantling and restoring this colossus of wrought iron, although that itself is a credit to planning, technology and craftsmanship and is worth reading for its own sake. The plants themselves, the palms, cycads, pandans and many species of tropical climbers are interestingly described and many species are illustrated by excellent colour photographs. Also described are the many different fruits and flowers of the rainforests.

Kew has always maintained that it should have living representatives of all groups of plants, but one group had been missing – the algae – so during the restoration the opportunity was taken to incorporate a marine aquarium in the basement of the Palm House. The basement had to be rebuilt as it was not strong enough to withstand the weight of the new planting beds above. The result is displays of the four most unique and inaccessible habitats in the world, two from around our coasts, the rocky shore and the muddy shore, and two from tropical areas, the coral reef and the mangrove swamp.

I found this a most enthralling book and can thoroughly recommend it. It is most attractively designed. Strangely, the only errors I noticed were a spelling mistake and a terminological mistake on the same page.

K. H. Hyatt

The Population of Three-spined Sticklebacks *Gasterosteus aculeatus* in an Epping Forest Pond

by Alwyne Wheeler*

The three-spined stickleback *Gasterosteus aculeatus* Linnaeus is a common fish in many ponds in Epping Forest. The drought during the summer of 1989 caused the water level of all Forest ponds to drop and some of the shallowest dried up completely. Amongst these was the northern-most pond on Bell Common (TL455016), close to the town of Epping. On 26 June there was 5-7.5 cm of water in this pond and many sticklebacks and four goldfish *Carassius auratus* (Linnaeus) were stranded in a shallow pool shaded by great water-grass *Glyceria maxima* (Hartm.) Holmberg. The goldfish were rescued and later transferred to garden ponds; at the same time a large number of sticklebacks were caught incidentally but, with one exception, died before they could be transferred to an aerated tank.

Exactly 600 sticklebacks were caught on this occasion and, bearing in mind that this was an incidental catch, it is estimated that the population of this pond was around 2,000 fish. Although the pond has overall dimensions of *c.* 9 × 30 m (including the *Glyceria* beds), on 26 June the fish were congregated in two areas, one about 2 × 2 m and the other 1 × 2 m. By 20 July the pond was dry.

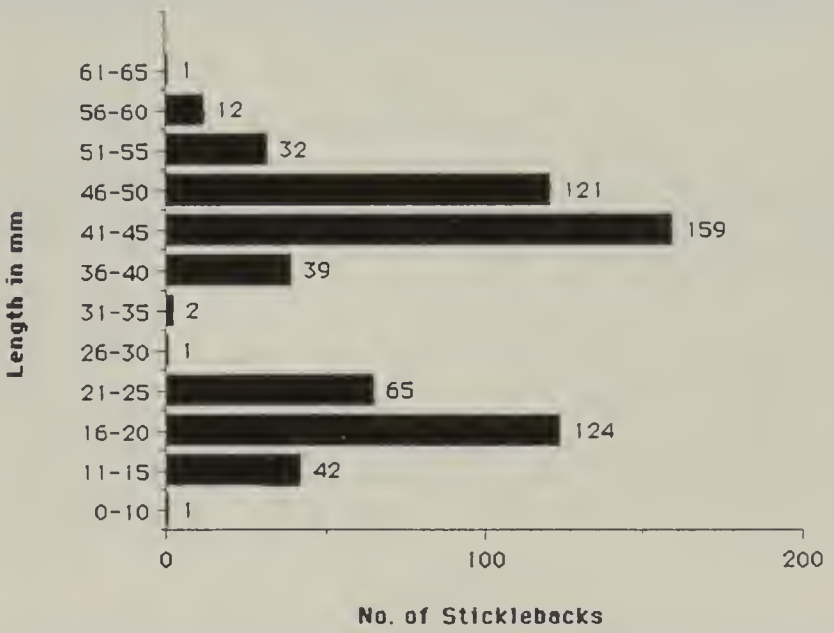

Fig. 1. Distribution of total length by 5mm classes of three-spined sticklebacks from a pond on Bell Common, Epping.

The sticklebacks were later measured. Figure 1 shows the frequency of each 5 mm length class in the sample and it is clear that two groups of length classes are represented (11-25 mm and 31-65 mm). This distribution can be related to the age of the fish, the 11-25 mm group being fish hatched in 1989 (0-group), the 31-65 mm fish being those of 1988 (1-group). There is no evidence from the histogram to indicate fish of an earlier year class; in this population sticklebacks evidently live for less than two years. Observations on other small Forest ponds

*Epping Forest Conservation Centre, High Beach, Loughton, Essex IG10 4AF.

showed that there is considerable mortality (not related to drought) during the late summer. For example, on 12 July, twenty-three large sticklebacks were found dead at the surface at Earls Path Pond, Loughton, which still retained a considerable quantity of water.

High mortality amongst sticklebacks shortly after the end of the breeding season has been reported elsewhere. Wootton *et al.* (1978) related this to depletion of lipid and glycogen energy reserves in females following the production of eggs. Recently, Chellappa *et al.* (1989) have shown that this applies to males as well and that the depletion of glycogen, lipid and body protein continues through the whole breeding season, these reserves reaching their lowest in June to July. It seems therefore that in breeding, both females and males draw so heavily on their energy reserves for egg production, or for courtship behaviour, the production of sperm and secretions from the kidneys to bind the nest together and guarding eggs and young, that natural mortality is very high in summer. Additional stress caused by drought conditions, even where water is present in ponds, with consequent elevation of temperature and at night carbon dioxide levels, and depression of dissolved oxygen due to high temperatures and demand from fish and other organisms, may be the trigger which results in mass mortality amongst the 1 + fish.

Acknowledgements

I am grateful to Ben Dyson for painstakingly measuring all 599 sticklebacks and to Jaequeline Moxey for produeing the histogram in Figure 1. I am also partieularly grateful to the Epping Forest Conservation Centre and Paul Moxey, the Warden and Direetor of Studies, for giving me space and facilities at the Centre.

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Changes in the Macro-Invertebrate Benthos of a Rural Essex Clay Stream Following Pollution by the Pesticide Dursban†

by S. Boreham* and P. Birch**

Abstract

In April 1985 an accidental spillage of the pesticide Dursban† 4E (chlorpyrifos) polluted Brookhouse Brook, a tributary of the River Roding, near Theydon Garnon, Essex. Chlorpyrifos residue data were obtained and the benthic macro-invertebrate fauna of the brook was sampled at seven sites affected by pesticide, and at three control sites over a two-year study period. The spill eliminated macro-invertebrates immediately downstream of the spill site and removed aquatic arthropods from other affected sampling stations. It appears that macro-invertebrates recovered their pre-spillage distributions within two years. Distance from the spill site, proximity of a source of macro-invertebrates, relative rates of drift and prevailing water quality governed the speed and extent of faunal recovery.

Introduction

Following the construction of the M11 and M25 motorways, the River Roding and its tributaries have been under increasing environmental pressure (Extence 1978, Stone 1981, Davis 1983, Davis and George 1987). Brookhouse Brook is a major tributary of the River Roding which drains 18.1 km^2 of the eastern slopes of the Epping Forest ridge. Much of the catchment is underlain by London Clay, and the stream receives some urban and highway runoff and agricultural and treated domestic effluents along its course (Boreham *et al.* 1989).

Road transport inevitably involves the risk of accidents and spills. On 2 April 1985 a lorry carrying the organophosphorus pesticide Dursban 4E, formulated as 41% w/w chlorpyrifos emulsifiable concentrate overturned on the M11 motorway, 1km north-east of the M11/M25 interchange at Theydon Garnon, Essex (TL478012). A spillage of approximately 500 litres occurred, and pesticide subsequently polluted Brookhouse Brook (Figure 1) and a 20-km stretch of the River Roding. The effects of the spill on macro-invertebrates in the River Roding have been studied by Boreham and Birch (1987) and the recovery of the Roding ecosystem has been assessed by Raven (1988). However Brookhouse Brook was exposed to greater concentrations of pesticide, and is a smaller stream than the River Roding. This study investigates the recovery of the benthic macro-invertebrate fauna of Brookhouse Brook and compares it with previous work from the Roding.

Methods

Water and sediment collected by Thames Water Authority personnel were analysed by Huntingdon Research Centre Ltd for chlorpyrifos using gas chromatography (Marshall and Roberts 1978). Monthly concentrations of chlorpyrifos in water draining from the spill site entering Brookhouse Brook and in brook water 2.75km downstream were provided by Thames Water (D. A. Stott, pers. comm.)

Seven sampling stations (Sites 2 to 8) affected by the pesticide and three control stations (Sites 1, S and T) unaffected by the pesticide were investigated

* University of Cambridge Botany School, Downing Street, Cambridge CB2 3EA.
**Environment and Industry Research Unit, Department of Biology and Biochemistry, North East London Polytechnic, Romford Road, London E15 4LZ.
† Dursban is a tradename of the Dow Chemical Company.

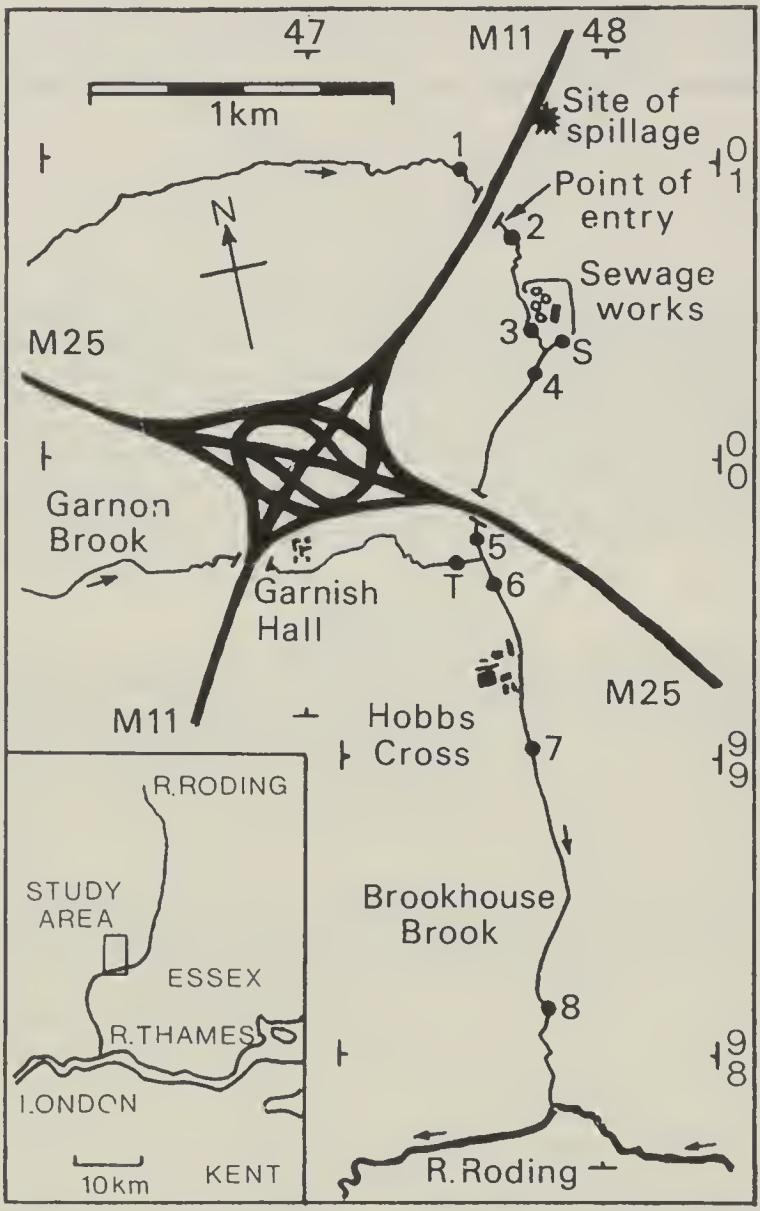

FIG. 1. The study area showing the site of the chlorpyrifos spillage and sampling sites on Brookhouse Brook.

six, nine, 12 and 24 months after the pollution incident. Site 1 (high water quality) was upstream of the point of pesticide entry, while the sewage outfall stream, Site S (poor water quality), and Garnon Brook, Site T (variable water quality), are both tributaries of Brookhouse Brook (Figure 1). Three 30-second kick samples of the benthic macro-invertebrate fauna were taken from a 1.5m section of a stable gravel riffle at each site, using a net with a mesh diameter of 250μm and an opening 230 by 225mm, adapted from Macan (1958). Replication of kick sampling was rejected despite increased statistical reliability because of the considerable habitat disturbance caused. The macro-invertebrates obtained from the combined samples were sorted in the laboratory and identified to species where possible.

The changing distribution and abundance of macro-invertebrates over the study period have been investigated. The BMWP score (National Water Council

1981), a qualitative hydrobiological index which gives high values for pollution-sensitive taxa and low values for pollution-tolerant taxa, was applied to the data. The average score per taxon (ASPT) which is less affected by seasonal variations (Murphy 1978) was also calculated. The BMWP score does not take abundance into account and is based on the relative tolerance of taxa to organic pollution. The number of taxa at each site and a quantitative community diversity index, the Shannon-Weaver Index (SWI) (McIntosh 1967) were also calculated, because they are not biased in this way.

Results

Chlorpyrifos residues in water draining from the spill site into Brookhouse Brook at Site 2, and in brook water at Site 8 are shown in Figure 2. The half-life of chlorpyrifos in natural waters is approximately 36 hours, although this is affected by temperature, pH and inorganic solutes. If chlorpyrifos is adsorbed to organic matter in sediments it can become stabilized and remain active for longer (Dow Chemical Company). An initial pollution front of about 10,000μg/l

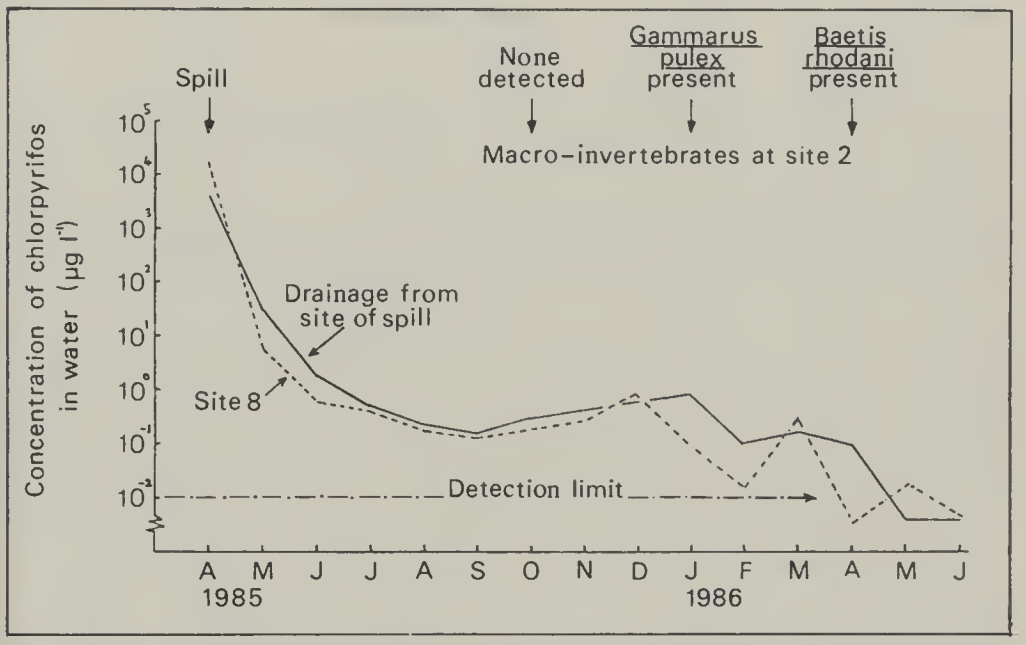

FIG. 2. The decline of chlorpyrifos residues in water draining from the spill site and in brook water at Site 8. The occurrence of selected macro-invertebrates at Site 2 immediately downstream of the spill site is also shown.

chlorpyrifos passed downstream following the spill and pesticide levels in water declined rapidly to around 0.5μg/l chlorpyrifos within 6 months. Although contaminated topsoil from the spill site on the motorway embankment had been removed, stream sediment at Site 2 contained up to 818mg/kg chlorpyrifos after the spill. Pesticide persisted in sediment at concentrations some ten times that of water for twelve months after the spill (Raven 1988). Chlorpyrifos inhibits cholinesterase activity in many arthropods, although lethal concentrations vary between species (Muirhead-Thomson 1971, 1987, Marshall and Roberts 1978). However much of these toxicological data are from ecosystems quite unlike Brookhouse Brook. Macro-invertebrates were not detected at Site 2 in October 1985, and further downstream where organisms survived, all aquatic arthropods were eliminated and there was a marked decrease in abundance and species richness of the non-arthropod fauna compared with unaffected sites. However, in January 1986 eight macro-invertebrate taxa, including the crustacean

Gammarus pulex, were present at Site 2, and by April 1986 this had increased to eleven taxa (Table 1).

TABLE 1. Recolonization of Site 2 by macro-invertebrates, and lethal concentrations of chlorpyrifos determined by Marshall and Roberts (1978). Only taxa recorded on two or more dates are included.

Group	Lethal conc.	Taxon	First present
Oligochaeta	>1,500ug/l	Tubificidae spp.	January 1986
		Erpobdella octoculata	January 1986
Mollusca	>540ug/l	*Potamopyrgus jenkinsi*	January 1986
		Physa fontinalis	January 1986
		Pisidium amnicum	April 1986
Gammaridae	<1ug/l	*Gammarus pulex*	January 1986
		Asellus aquaticus	January 1986
Chironomidae	0.1-6.5ug/l	Chironomidae spp.	January 1986
Baetidae	0.5-1.0ug/l	*Baetis rhodani*	April 1986
Linmephilidae		*Limnephilus lunatus*	April 1986
Simuliidae		*Simulium* spp.	April 1986

In October 1985, Chironomidae were present in affected parts of Brookhouse Brook from Site 4 downstream, and the crustacean *Asellus aquaticus* was present at Sites 4, 5 and 6. These taxa were rapid recolonizers of the River Roding following the spill (Boreham and Birch 1987, Raven 1988). In addition, the larva of the caseless caddis-fly *Hydropsyche angustipennis,* which was present at control Site T, also occurred at Site 6. This taxon is described in Raven (1988) as a moderate recolonizer in the River Roding. In January 1986 recolonization by some aquatic arthropods occurred at all affected sites. Significantly *Gammarus pulex* was present at Sites 2, 6 and 7. The abundance and species richness of the non-arthropod fauna also increased at most sites. Unfortunately, in April 1986, control Site T on Garnon Brook was damaged by a pollution incident involving organic farm waste. As a result many of the recolonizing organisms which had occurred at Sites 6, 7 and 8 were lost. However, recolonization at Site 2 continued, with the occurrence of the mayfly *Baetis rhodani,* the cased larvae of the caddis-fly *Limnephilus lunatus* and other taxa. In April 1987 Sites 1, 2 and 3 all had a similar fauna characterised by a diverse pollution-sensitive community distinct from that of Sites S, 4 and 5, which were dominated by a few taxa tolerant of organic pollution. The fauna of Sites 6, 7 and 8 was most similar to that of site T, having a combination of pollution-sensitive and tolerant taxa reflecting variable water quality.

The BMWP score, average score per taxon (ASPT), number of taxa, and the Shannon Weaver Index (SWI) for all sites in October 1985, January and April 1986 and April 1987, are shown in Figure 3. The four indices all show a broadly similar pattern over the study period. A marked recovery of the impoverished fauna downstream of the sewage outfall (Site 4) had occurred by October 1985, yet a similar degree of recovery at Site 6 did not occur until January 1986, and it was not until April 1986 that almost complete recolonization occurred at Site 2. This suggests that the most diverse macro-invertebrate communities took longest to become re-established. However, Site 3 showed poor recovery over the study period, but may have been affected by the adjacent sewage works.

Discussion and Conclusions

Following the spill, concentrations of chlorpyrifos were lethal to all macro-invertebrates immediately below the point of pesticide entry, but further downstream some non-arthropod taxa occurred. Although levels of chlorpyrifos in brook water declined rapidly, allowing recolonization by pesticide-sensitive arthropods (such as Chironomidae), contaminated sediment prevented recovery

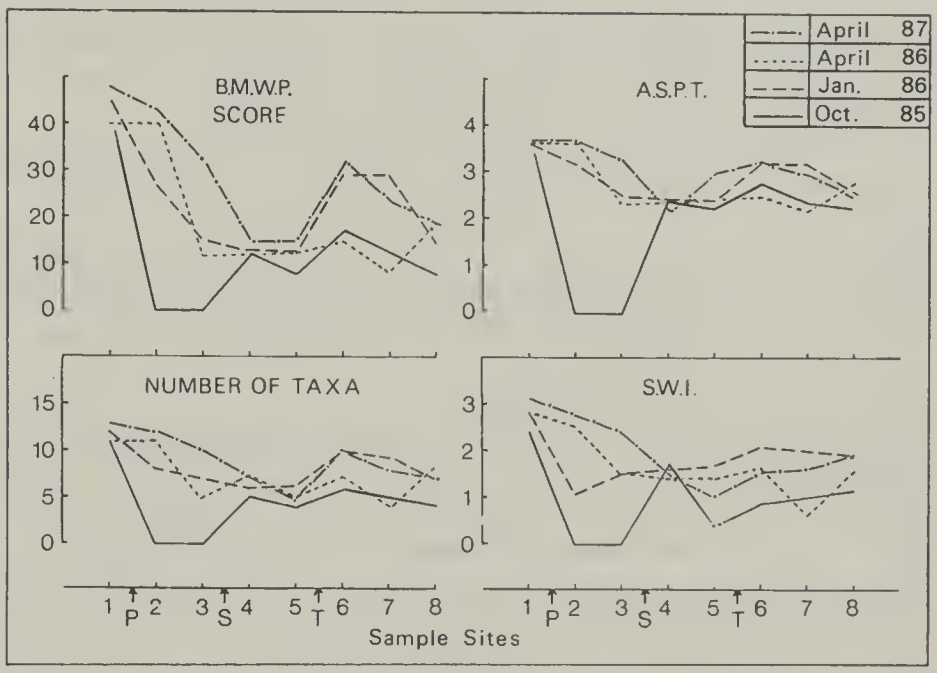

FIG. 3. The BMWP Score, average score per taxon (ASPT), number of taxa and Shannon-Weaver Index (SWI) for all sites over the study period. N.B.: P = Point of pesticide entry. S = Confluence of sewage outfall stream (Site S). T = Confluence of Garnon Brook (Site T).

at Sites 2 and 3 for at least six months after the spill. Macro-invertebrates present in October 1985 had survived the spill, or had immigrated as a result of downstream drift from the sewage outfall stream (Site S) and Garnon Brook (Site T). Hynes (1960), pointed to the importance of downstream drift in the recovery of macro-invertebrates following a pollution incident. In January 1986 (nine months after the spill) the fauna at Sites 2, 4 and 6 had recovered markedly and by April 1987 it is probable that macro-invertebrates had assumed their pre-spillage distributions. There appeared to be no relationship between sensitivity to chlorpyrifos and the order in which taxa returned to the affected sites.

The rapid recovery of macro-invertebrates in Brookhouse Brook following gross chlorpyrifos pollution demonstrates the resilience of such an ecosystem. Comparison between the BMWP score and ASPT suggests that seasonal variation had a minimal effect on re-colonization. Distance from the spill site, proximity of a suitable source of macro-invertebrates, relative rates of drift, and prevailing water quality governed the extent and speed of faunal recovery. Even heavily contaminated sites recovered fully, although no affected sites were more than 1km from a source of macro-invertebrates. However, the transport of contaminated sediment, and the longer term cumulative sub-lethal effects of pesticide on the ecosystem remain largely unknown.

Acknowledgements

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The Chydoridae and Macrothricidae (Crustacea: Cladocera) of the Wimbledon Common and Putney Heath Ponds

by Anne L. Robertson*

Summary

This paper presents the results of a survey of the Chydoridae and Macrothricidae in Wimbledon Common and Putney Heath ponds. The ponds were found to support a low diversity of these families and possible reasons for this are discussed. Differences between the ponds surveyed are related to pH and macrophyte abundance.

Introduction

The Cladocera of the Wimbledon Common and Putney Heath ponds do not seem to have been studied in the past. This paper goes some way towards closing this gap by presenting the results of a survey of the Chydoridae and Macrothricidae. It is hoped to study the rest of the Cladocera at a later date.

The Chydoridae and Macrothricidae are families of the Order Cladocera, Class Crustacea. They feed on small particles, such as fine detritus, and are adapted to fill a variety of niches associated with the aquatic vegetation and substrate of the littoral region of lakes, rivers and smaller water bodies. As well as these more usual habitats, Chydoridae have also been found in the groundwater (Dumont 1987) and in moss seeps (Fryer 1980). The carapaces of the Chydoridae preserve well in lake sediments and have been used to examine changes in environmental conditions, including acidity and the degree of eutrophication in lakes over time (for example, Einarsson 1982, Krause-Dellin and Steinberg 1986, Hofmann, 1987).

Chydoridae are small animals ranging from 0.2-3.0mm in length and predators include fish such as roach *Rutilus rutilus* (L.) (Mann 1973, Townsend *et al.* 1986) and numerous invertebrates, for example, dragonfly larvae (Johnson, Akre and Crowley 1975) and Copepoda (Kerfoot 1977). Chydoridae thus form an important link in the detritus food chain.

Site Description

Wimbledon Common is an open, vegetated area to the south-west of London. It consists of a plateau of London Clay covered by a thin cap of gravel. Peat has developed in some areas. The plateau vegetation is a mixture of acid grasses, heather and birch with occasional areas of oak woodland. The seven permanent ponds of Wimbledon Common and Putney Heath were surveyed.

(See Postscript on p. 90)

Wimbledon Common

Bluegates Gravel Pit (TQ235718)
Former gravel pit, shallow acidic pond, bottom sometimes coated with *Sphagnum*. Sometimes dries up (completely in 1989). Banks not made up. pH 5.

Hookhamslade Pond (TQ232718)
Small acidic pond surrounded by dense birch scrub. Banks not made up. Not many water plants. pH 4.1.

Kingsmere Pond (TQ232733)
Large shallow pond set in open birch heath. Edges mostly not made up. Virtually devoid of water plants. Some fish have been introduced. pH 6.2.

*Department of Environmental and Geographical Studies, Southlands College (Roehampton Institute), Wimbledon Parkside, London SW19 5NN.

Queensmere Pond (TQ226725)
Formed by damming in Victorian times. Edges made up and therefore no aquatic edge vegetation. Surrounded by mature oak woodland. Deepest pond on Common. Not many water plants. pH 7.1.

Seven Post Pond (TQ235733)
Small shallow pond, abundant water plants. One side made up, the others natural. On the edge of open oak woodland. Some pike *Esox lucius* present. pH 7.4.

Rushmere Pond (TQ236711)
Shallow pond, gradually sloping with gravel bottom. No water or edge plant species. Surrounded by open grassland. pH 6.6

Putney Heath

Scio Pond (TQ229734)
Edges made up, but because fairly shallow has good aquatic edge vegetation and substantial amounts of water plants throughout the pond. pH 7.2.

Methods

Each pond was sampled a number of times at different seasons and over several years (1985-89). On each occasion open water, mud and aquatic weeds were sampled using a fine-mesh net (mesh size 80μm). Cladocera obtained were identified using the key by Scourfield and Harding (1966) and the pH was also determined.

Results

There are marked differences in the number of species of Chydoridae and Macrothricidae found in each pond (Table 1). Bluegates and Hookhamslade have just one species each whereas Queensmere and Seven Post Ponds have five and six respectively.

Table 1. Macrothricidae and Chydoridae found in the seven permanent ponds of Wimbledon Common and Putney Heath.

	Bluegates	Hookhamslade	Kingsmere	Queensmere	Seven Post	Rushmere	Scio
Family Macrothricidae							
Iliocryptus sordidus (Lievan)	−	−	+	+	+	+	−
Family Chydoridae							
Eurycercus lamellatus (O. F. Müller)	−	−	−	−	+	−	−
Alona affinis Leydig	−	−	−	+	+	−	−
A. guttata Sars	−	−	−	+	+	−	−
A. rectangula Sars	−	−	−	−	+	−	−
Acroperus harpae Baird	−	−	−	+	−	−	−
Chydorus sphaericus (O. F. Müller)	+	+	−	+	−	−	+
Graptoleberis testudinaria (Fischer)	−	−	−	−	+	−	−
Disparalona rostrata (Koch, 1841)	−	−	−	−	−	+	+
Pleuroxus denticulatus Birge	−	−	−	−	−	−	+
Total number of species found	1	1	1	5	6	2	3

There was also a wide variation in the number of species of aquatic macrophytes present (Table 2). Rushmere is completely devoid of vegetation, whereas Seven Post and Scio Ponds possess an abundant and diverse pond flora.

TABLE 2. Aquatic macrophytes found in the seven permanent ponds of Wimbledon Common and Putney Heath.

	Bluegates	Hookhamslade	Kingsmere	Queensmere	Seven Post	Rushmere	Scio
Spirogyra sp.	–	–	–	–	–	–	+
Nitella flexilis stonewort	–	–	–	+	–	–	–
Cedogonium sp.	–	–	–	–	–	–	+
Azolla filiculoides water fern	+	–	–	–	–	–	–
Nymphaea alba white water lily	–	–	+	–	+	–	+
Callitriche sp. starwort	–	–	–	–	–	–	+
Alisma plantago-aquatica water plantain	–	–	–	–	–	–	+
Elodea canadensis Canadian pondweed	+	–	–	+	+	–	+
Lagarosiphon major curly water thyme	–	–	–	–	–	–	+
Potamogeton natans broad-leaved pondweed	–	–	–	–	–	–	+
Iris pseudacorus yellow flag	+	–	–	–	+	–	+
Lemna major duckweed	–	–	–	–	–	–	+
Sparganium erectum branched bur-reed	–	–	–	–	+	–	–
Sparganium minimum small bur-reed	–	–	–	–	–	–	+
Typha angustifolia lesser reedmace	–	–	–	–	+	–	–
Typha latifolia bulrush	–	–	–	–	+	–	–
Glyceria fluitans floating sweet grass	–	–	–	–	+	–	–
Cyperus longus galingale	+	–	–	–	–	–	–
Carex pendula pendulous sedge	–	–	–	+	–	–	–
Juncus acutiflorus sharp-flowered rush	+	+	–	–	–	–	+
Juncus articulatus jointed rush	+	+	+	+	+	–	+
Juncus bulbosus bulbous rush	+	+	–	–	–	–	–
Juncus effusus soft rush	+	–	–	–	–	–	+

Discussion

Notes on Species Found on Wimbledon Common and Putney Heath

Chydorus sphaericus

Extremely common chydorid able to tolerate a wide range of conditions. Occurs particularly in small bodies of water or in the littoral zone of lakes (Fryer 1968). Found sometimes in the open waters of lakes as it is an opportunistic rider on filaments of blue-green algae. Female to 0.5mm. pH range 3.4-9.2 (Lowndes 1952). Often considered an indicator species since it can occur in high numbers in cases of extreme eutrophication (Duigan and Murray 1987). Until recently *C. sphaericus* was thought to be a cosmopolitan species occurring as far apart as the U.S.A. and the U.K. Recent studies by Frey (1985) have shown that it is, in fact, a complex of closely related species.

Alona affinis

Tolerant of a wide range of conditions but shows preference for life on or among the bottom sediments in the littoral zone of lakes and smaller water bodies (Fryer 1968). Prefers weakly alkaline/acid waters although Lowndes (1952) gives its pH range as 4.6-9.2. Can be found among vegetation.

Acroperus harpae

Common in the littoral region of lakes and smaller bodies of water. Found occasionally on bare, rocky shores or over sand, but much more frequent among vegetation of various kinds. Female to 1mm.

Disparalona rostrata

Distinct preference for muddy bottoms which may overlie stone or sand. Moves through mud rather than crawling over it. Thought food not collected

by scraping, but is extracted from stirred-up particles (Fryer 1968). Female to 0.5mm.

Graptoleberis testudinaria

Associated particularly with dense stands of vegetation (Flössner 1964, Fryer 1968). The latter suggests that the existence of suitable vegetation is much more important as an ecological requirement of this species than physical or chemical parameters. Moves slowly over plant surfaces, scraping food as it goes. Female to 0.7mm.

Alona rectangula

Fryer (1968) suggests detritus-rich situations at the base of plants suit this species, but it is a member of the littoral benthic taxocene (Robertson 1990). Female to 0.5mm.

Alona guttata

Burrows through flocculent detritus. Female to 0.4mm.

Eurycercus lamellatus

Common and widely distributed among weeds (Scourfield and Harding 1966). On or near the bottom. This is a relatively large species (female to 4mm) which can produce more than two eggs at any one time.

Iliocryptus sordidus

Typical bottom form, incapable of swimming, ploughs through mud. Female to 1mm, always reddish or pink.

The ponds on Wimbledon Common and Putney Heath contain few species of Chydoridae and Macrothricidae compared to larger water bodies. Quade (1973), for example, found 22 species of Chydoridae in Crooked Lake, an alkaline water body in Indiana, U.S.A., and Whiteside (1974) recorded 21 species of Chydoridae in Elk Lake, Minnesota, U.S.A. Fryer (1985) has found that the Chydoridae show an unambiguous preference for large water bodies and are quite rare in ponds. He studied a large number of weakly acid or alkaline ponds and lakes and found that the mean number of chydorid species per water body rises from 1.1 (range 0-5) in ponds ($<5{,}000m^2$) to 7.5 (range 2-12) in large water bodies ($>15{,}000m^2$). The mean number of chydorid species on Wimbledon Common and Putney Heath is 2.3 (range 0-5), rather higher than Fryer's figure for the same size category although the range is the same. The reasons for this relative rarity are uncertain although several possibilities can be discussed:–

No chydorid is planktonic, except possibly *Chydorus sphaericus,* and so would not be disadvantaged by the lack of open water in the ponds. Many chydorids favour weed beds or stands of marginal vegetation (for example, *Graptoleberis testudinaria* and *Acroperus harpae*) which generally have a greater area in larger water bodies. To a chydorid, however, often smaller than 1mm, a $5m^2$ clump of vegetation is an extensive habitat and there is no obvious reason why a clump of weeds this size (for example in Scio Pond) should not support as diverse a chydorid fauna as a similar clump in a large water body. In any case, not all chydorids require weed beds, several chydorid species belong to the littoral benthic taxocene, whose members are found characteristically in the sediment of still and flowing waters where no vegetation occurs (Robertson 1990). Distribution of these species should be unrelated to weed-bed availability and yet only four members are found on Wimbledon Common and Putney Heath and these only in a few ponds (Table 1).

Knowledge of the role played by predators in chydorid ecology is limited. Young fish are known to feed on chydorids (Robertson 1990, Townsend *et al.* 1986) and will select the larger species such as *Eurycercus lamellatus.* Fish predation can have a significant impact on the population of this species

(Straskrăba 1963) and the preference of *E. lamellatus* for dense stands of aquatic plants may have evolved as much for protection against fish as for getting food (Frey 1973). Both Seven Post Pond and Scio Pond possess dense stands of weeds and also vertebrate predators, but only Seven Post Pond supports a population of *Eurycercus lamellatus*.

Chydorids are also preyed upon by invertebrate predators (*e.g.* Frey 1973, Kerfoot 1977) and many of these are abundant in the ponds (*e.g.* dytiscid beetle larvae, Zygoptera nymphs, tanypod larvae and cyclopoid copepods). Such predators, however, are also present in large water bodies which support a greater chydorid species diversity.

Dispersal may explain partially the low species diversity in ponds as opposed to larger water bodies. All chydorids produce drought-resistant resting eggs which are thought to be agents of dispersal. If dispersal is random the chance of a water body being colonised is related directly to its size. So, assuming all factors apart from size to be equal, larger water bodies might be expected to have richer chydorid faunas than smaller ones. However, very little research has been done on this subject. Furthermore, some chydorids attach their egg-containing ephippia to firm substrata (Fryer and Frey 1981) which is likely to reduce the possibility of dispersal.

The seven ponds can be grouped in a variety of ways that may be relevant to the observed chydorid and macrothricid assemblages: pH is one parameter that has been shown to have a marked impact on the cladoceran fauna of a water body. Fryer (1980) has described a relationship between the pH of a water body and the diversity of its crustacean fauna, whereby the species diversity decreases with increasing acidity.

TABLE 3. Comparison between species diversity and water acidity.

Pond	pH	Nos of chydorid/ macrothricid species
Hookhamslade	4.1	1
Bluegates	5.0	1
Kingsmere	6.2	1
Rushmere	6.6	2
Queensmere	7.1	5
Scio	7.2	3
Seven Post	7.4	6

Table 3 indicates that such a relationship may well be operating on Wimbledon Common and Putney Heath. Hookhamslade and Bluegates, the most acidic ponds, have just one species each, the ubiquitous *Chydorus sphaericus*. On the other hand, Queensmere, Scio and Seven Post Ponds, whose pH is above neutral, have five, three and six species respectively.

The nature of the littoral zone, *i.e.* the abundance and diversity of macrophytes and therefore the number of microhabitats available, is an important determinant of species diversity among small cladocerans (Fryer and Forshaw 1979). Rushmere has no vegetation at all, which may explain why, despite its moderate pH (6.6), it has just one chydorid species *Disparalona rostrata* and one macrothricid species *Iliocryptus sordidus*, both of which belong to the littoral benthic taxocene. Seven Post and Scio Ponds, on the other hand, have diverse and abundant macrophyte communities, and this, together with pH, may explain their relatively diverse chydorid and macrothricid communities.

Differences in the exact species found in each pond may be explained partly by examining individuals' specific requirements. *Graptoleberis testudinaria*, for example, is associated with dense stands of vegetation from which it obtains its

food. This species would not be expected to occur in ponds sparse in vegetation and is only present in Seven Post Pond.

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POSTSCRIPT

During winter 1989-90 the London Wildlife Trust dug out Fishponds on Wimbledon Common (TQ220708). A survey in April 1990 resulted in one species of Chydoridae (*Chydorus sphaericus*) and no Macrothricidae.

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Further Observations on the Terrestrial Mite Fauna of Headley Heath, Surrey

by Keith H. Hyatt*

Abstract

Brewster (1978) recorded two species of primitive moss-mites (Acari: Cryptostigmata), namely *Gehypochthonius rhadamanthus* Jacot, 1936 (family Gehypochthoniidae) and *Atopochthonius artiodactylus* Grandjean, 1948 (family Atopochthoniidae), from soil samples taken at Headley Heath, Surrey, following the severe drought of 1976. Both families were new to the British Isles. At the time it was intended to identify the entire collection, but circumstances changed and the author discontinued her work on the Acari. However, as a considerable amount of identification had been carried out on the collection the opportunity is taken now to place this on record.

Three of the species, *Veigaia exigua* (Berlese), *Acotyledon strenzkei* Türk & Türk and *Calvolia fraxini* Türk & Türk, are recorded from Britain for the first time.

The material, including the unsorted samples, is retained as a discrete collection in the Arachnida Section of The Natural History Museum in London.

Introduction

Headley Heath, Surrey (TQ2053) is an area of common land of about 200 hectares (500 acres) close to the eastern boundary of the Box Hill Estate. During the severe drought in the summer of 1976 many areas caught fire and, at The Pyramids fire persisted for three to four weeks, spreading underground, destroying all plant growth and charring the soil over a large area. In early September 1976, after the fires had died out from this area, Brewster (1978) commenced the collection of soil samples at monthly intervals in order to extract the mites. At the same time, and as a control, samples were gathered from areas unaffected by fire. It was hoped that the effects of the fires on the mite fauna could be shown and its subsequent recovery monitored, but unfortunately work was terminated when less than half the samples had been sorted.

However, it is felt that the identifications made should be placed on record as constituting a preliminary survey of the acarine fauna of Headley Heath — a typical Surrey downland heath.

The Collection

Of the 26 samples collected between September 1976 and September 1977, in

Table 1. Soil samples **1-*26*** from The Pyramids, Headley Heath, September 1976 to September 1977.

Unburnt bracken *Pteridium aquilinum* humus		**Burnt heathland topsoil**
1	5 September 1976	***2***
3	10 October 1976	***4***
5	7 November 1976	***6***
7	19 December 1976	***8***
9	16 January 1977	***10***
11	13 February 1977	***12***
13	12 March 1977	***14***
15	17 April 1977	***16***
17	15 May 1977	***18***
19	19 June 1977	***20***
21	17 July 1977	***22***
23	14 August 1977	***24***
25	11 September 1977	***26***

*c/o Dept. of Zoology, British Museum (Natural History), London SW7 5BD.

only 11 were the mites counted and identified. The samples, which were gathered at The Pyramids, Headley Heath, are listed in Table 1, whilst the mites, removed almost entirely from samples **1-11,** are listed in Table 2. In Tables 1 and 2 the even-numbered samples, from burnt heathland, are in bold ***italics*** and the numbers of specimens removed are in light *italics,* whilst the odd-numbered, unburnt samples and specimens are in roman.

For nomenclatural reasons, authorities are given for named species.

TABLE 2. Mites from samples **1-11** collected at The Pyramids, Headley Heath, September 1976 to February 1977. With three exceptions, involving six specimens only (samples ***12***, **13** and **21**), the remaining samples have not been examined. The developmental stages are given only when indicated on Brewster's working sheets. In most cases the number of specimens is given without the stage being indicated.

MESOSTIGMATA
Asca aphidioides (L.) **1** 1♀, **5** 1.
Cosmolaelaps claviger (Berl.) **3** 3.
Dendrolaelaps sp. ***6*** *146,* ***10*** *59.*
Dendroseius sp. ***8*** *22.*
Digamasellus sp. ***2*** *109,* ***4*** *110.*
Hypoaspis aculeifer (Can.) **1** 1♀, ***2*** *1*♀, **3** 12, ***4*** *24,* **5** 5, ***6*** *16,* **7** 5, ***8*** *4,* **9** 3, ***10*** *2,* **11** 3.
Hypoaspis sp. **3** 5DNN.
Macrocheles opacus (C. L. Koch) **1** 1♀, **7** 3, **9** 2.
Macrocheles sp. **11** 1 imm.
Olodiscus sp. **3** 5, **7** 17, **9** 4.
Pachylaelaps sp. **1** 1♂, **3** 1, **5** 3, **11** 1.
Parasitoidea ***2*** *4*LL.
Pergamasus lapponicus Träg. **7** 2, **9** 1, ***10*** *1.*
Pergamasus sp. **3** 1, **5** 3.
Platyseius sp. ***8*** *1.*
Polyaspidoidea **11** 1.
Polyaspinus sp. **1** 1, **5** 6.
Prozercon sp. **5** 1.
Pseudouropoda sp. **1** 1L, 1PN, 2DNN, 2♀♀.
Rhodacarus sp. **1** 15DNN, 9♀♀4♂♂, **3** 82, ***4*** *9,* **5** 35, ***6*** *3,* **7** 134, ***8*** *1,* **9** 174, ***10*** *3,* **11** 145.
Typhlodromus (Amblyseius) cucumeris Oud. ***4*** *1.*
Typhlodromus (Amblyseius) sp. **1** 1.
Typhlodromus (Typhlodromus) sp. ***4*** *2.*
Typhlodromus sp. **11** 1.
Uropodidae ***10*** *3,* **11** 3.
Veigaia bouvieri (Berl.) **1** 5DNN, **3** 1, **5** 6, ***6*** *3.*
Veigaia cervus (Kram.) **5** 4, **7** 7, **9** 1, **11** 2.
Veigaia exigua (Berl.) **9** 6, **11** 13. This is only the second record of this predominantly European species from the British Isles. Till (1988) recorded a single female from Co. Wexford, Ireland.
Veigaia nemorensis (C. L. Koch) **3** 2DNN, 1♀, **5** 14, ***6*** *8,* **7** 6, **9** 2, ***10*** *2,* **11** 8.
Veigaia planicola (Berl.) ***4*** *2.*
Veigaia serrata Willm. **9** 2.
Zerconopsis remiger (Kram.) ***4*** *2*♀♀.

PROSTIGMATA
Alicorhagiidae **1** 6, **3** 1, **5** 21, **7** 47, ***8*** *7,* **9** 13, ***10*** *7,* **11** 49.
Bdellidae **5** 1.
Cheyletidae **5** 1.
Cunaxidae **1** 3.
Ereynetidae ***8*** *1,* **11** 1.
Eupodidae **1** 15, **3** 9, ***4*** *4,* **5** 18, ***6*** *24,* **7** 74, ***8*** *13,* **9** 27, ***10*** *17,* **11** 92.
Linopodes sp. **1** 37, **11** 13.
Nanorchestidae **1** 1, **3** 8, ***4*** *1,* **7** 170, **9** 8, **11** 26.
Pachygnathidae **1** 5.
Pediculaster mesembrinae (Can.) ***4*** *201,* **5** 26.
Pediculaster sp. ***6*** *4,442,* ***8*** *110,* **9** 2, ***10*** *1,608.*
Penthalodidae ***6*** *3,* **9** 1, ***10*** *1,* **11** 21.
Pseudotarsonemoides sp. ***8*** *1.*

Pyemotidae **1** 6, *2 7,* **3** 29, **7** 1, **11** 1.
Rhagidiidae **1** sp. A 44, sp. B 10, *2 3,* **3** 20, **5** 50, *6 7,* **7** 49, **9** 11, *10 6,* **11** 74.
Scutacaridae **7** 4.
Stigmaeidae **1** 41, **3** 5, **5** sp. A 10, sp. B 3, **7** sp. A 4, sp. B 5, **9** sp. A 4, sp. B 4, **11** 68.
Terpnacaridae *6 2, 8 12, 10 12.*
Terpnacarus sp. **9** 1.
Tydeidae *4 2.*

ASTIGMATA
Acaridae **1** 1, **3** 4 hypopi.
Acarus siro L. **11** 36.
Acotyledon strenzkei Türk & Türk **9** 1. Previously known from Germany, this is probably the first British record of this species.
Anoetinae **9** 1.
Calvolia fraxini Türk & Türk *10 123* hypopi. Previously known from Germany, this is probably the first British record of this species.
Calvolia transversostriata (Ouds.) *4 675* including hypopi.
Calvolia sp. **5** 1, *6 120.*
Caloglyphus sp. **1** 1, **3** 17, *8 12.*
Chortoglyphus ?arcuatus (Troup.) *2 1*♀.
Glycyphagus domesticus (De Geer) **3** 5, *4 2,* **5** 1.
Histiostoma feroniarum (Dufour) *2 10*♂♂♀♀, *4 8, 6 2, 8 14, 10 27,* **11** 8.
Histiostoma sp. **5** 1.
Rhizoglyphus ?robini Clap. **9** 1.
Rhizoglyphus sp. *2 1*♀, **3** 3, **7** 15, **9** 3 hypopi.
Tyrophagus putrescentiae (Schr.) *4 76,* **5** 1.
Tyrophagus sp. **3** 1.
Hypopial nymph *6 1.*

CRYPTOSTIGMATA
Atopochthonius artiodactylus Grand. **7** 1, **9** 1, **11** 4, **13** 1, **21** 4.
Brachychthoniidae **3** 2, *6 6,* **7** 60, *8 2,* **9** 23, *10 60,* **11** 84.
Camisiidae **7** 10.
Chamobates sp. **1** 1, **3** 5, *6 1, 10 2,* **11** 1.
Chamobatidae **9** 2.
Cosmochthoniidae **5** 8, *6 7.*
Damaeidae **3** 9, *4 4,* **5** 76, *6 4,* **7** 79, *8 8,* **9** 86, *10 12,* **11** 230.
Eniochthonius sp. *2 1,* **3** 5, *6 1,* **7** 1, **11** 2.
Galumnidae **1** 1, **3** 3, **5** 2, **7** 1, **9** 1, **11** 1.
Gehypochthonius rhadamanthus Jacot **3** 26, **5** 15, **7** 106, **9** 27, **11** 73.
Hypochthoniella sp. **1** 10.
Mycobatidae/Ceratozetidae **3** 1.
Nanhermannia sp. *4 1.*
Nothrus biciliatus C. L. Koch **9** 41.
Nothrus palustris C. L. Koch **1** 36, **11** 1.
Nothrus sylvestris Nic. **3** 18, **5** 35, *6 1,* **7** 15, **11** 57.
Nothrus sp. **7** 1.
Odontocepheus sp. **11** 1.
Oribatula sp. **1** 6.
Oribatulidae *4 1,* **5** 1, **7** 14.
Oribatulidae/Scheloribatidae **3** 6, **9** 6, **11** 1.
Palaeacarus hystricinus Träg. **1** 4.
Palaeacarus sp. **5** 1, **7** 1, **11** 2.
Phthiracaridae **3** 19, *4 2,* **5** 24, **7** 4, **9** 24, **11** 23, *12 1.*
Platynothrus peltifer C. L. Koch **1** 3, **11** 3.
Platynothrus sp. **3** 1, *4 1,* **5** 1.
Punctoribates sp. **1** 7.
Suctobelba sp. **1** 7.
Tectocepheus sp. **1** 1, **3** 26, **5** 4, **7** 1, **9** 10, **11** 18.
Unidentified nymphs **3** 21, *4 54* circumhiscidentiae, *6 8, 8 7, 10 2,* **11** 38.

Remarks

Of the 101 'species' listed in Table 2, 53 were found only in samples from unburnt litter, whilst 17 were found only in the gatherings of burnt topsoil. The

remaining 31 were found in both the burnt and the unburnt samples. The two species of Cryptostigmata recorded by Brewster (1978) were found only in the unburnt litter. It is possible that some conclusions could be drawn from these proportions when combined with an analysis of the data in Table 2, but I prefer not to speculate. The intention is to place the collection on record so that future students are aware of its existence.

With the exception of the two species recorded by Brewster (1978) and the three additional species recorded as new to Britain, and referred to in the Abstract, the remaining named species are largely regular and well-known components of the British fauna. Those identified to genus or family only are most probably not readily recognizable species, and therefore some would, no doubt, if examined in the future, be found to represent taxa that are new to science or at least new to the British fauna. With the increased interest in recent years in the taxonomy of British mites, a collection containing species, genera, or occasionally families, new to the British Isles is quite normal. Therefore, it is hoped that the stimulus is provided for future work on this or similar surveys.

Acknowledgement

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A Study of the Spider Fauna of Queen's Wood, North London and Some Comparisons With Two Other London Woodlands

by J. Edward Milner*

Summary

Between April 1988 and March 1990, a study was made of the spider fauna of Queen's Wood in north London. Seventy-six species are recorded. Comparisons are made with Alexandra Park, also in north London, and Oxleas Wood, in southeast London.

Introduction

Queen's Wood (22.3 ha), TQ288886, formerly known as Churchyard Bottom Wood (Silvertown 1974), can be traced back to medieval times as an open space. It was certainly part of the original Forest of Middlesex, and marked by John Jocque on his Map of Middlesex published in 1754 (Latimer 1984).

Traces of a bank and associated ditch, the physical signs that traditionally delineate the boundary of managed woodland, can still be found along the western edge of the wood, but whether it has always been woodland is open to doubt (Latimer 1984). Today it is a beautiful stretch of woodland with many fine mature oaks on ground sloping quite steeply south and east. A small stream flows intermittently through the northern part of the Wood, which is separated from the southern part by a road, Wood Vale. However, close inspection reveals a sparse ground flora, a rather unnatural uniformity, heavily worn paths and very little natural regeneration in many parts of the Wood. Until recently there was also a most unnatural lack of dead and decaying wood.

The Wood was purchased for £30,000 by Hornsey District Council in 1889, renamed Queen's Wood after Queen Victoria and opened to the public (Millington and Robinson 1985). The Council is now called Haringey Borough Council, who are at this time (early 1990) in the process of designating Queen's Wood as a Local Nature Reserve.

The vegetation is generally open oak/hornbeam woodland growing on London Clay with some traces of glacial deposits. The oaks are mostly *Quercus robur* with some *Q. petraea,* and apart from the hornbeam there are mature beech, birch, wild service, and whitebeam, together with an understorey of rowan, holly and hawthorn, with scattered hazel and elder. Some of the hornbeams show evidence of having been coppiced and in some parts pollarded in the distant past. Other native tree species which occur in the wood are yew, field maple, ash, common lime and apple (Millington and Robinson 1985). Some birch and cherry are also present, as well as sweet chestnut and a few sycamore. There is a ground cover of grass in many clearings, mostly *Holcus mollis.* Other common plants present are bramble (typically around 15% of the ground cover), ivy, and occasional rather small patches of woodland flowers such as wood anemone, cow-wheat and, in a few places, bluebells.

According to Latimer (1984) the management of the Wood in recent times has involved little more than the misconceived removal of dead wood and 'improvements' to the drainage. This latter does not affect the area studied by the writer, as the ground is mostly sloping and shows no evidence of having had its drainage altered. There are however a number of tarmac paths even through parts of Queen's Wood that are 'among the most "wild" woodland areas in the Borough' (Bantock 1984). In fact the Wood as a whole must be one of the most

*80 Weston Park, London N8 9TB.

heavily used, and therefore ecologically disturbed, pieces of semi-natural woodland in London.

Until recently much of the canopy was fairly dense, but in the last three years, starting with the great storm of October 1987, a number of mature trees and very many large limbs have fallen. As a result the Wood is now very much more open than it was and the clearings larger and more frequent. As a direct result the areas of bramble and grass have increased, at least in the southern part.

After the 1987 storm Haringey Borough Council spent a great deal of effort 'clearing up' the fallen logs and trees until they were restrained by popular demand. There is now a more natural amount of fallen and decaying wood which is beginning to improve the Wood in a variety of ways, not least in its general appearance (Figure 1).

FIG. 1. Queen's Wood, London Borough of Haringey. General view of the south part of the Wood, looking west and showing the open nature of the ground level.

Materials and Methods

Having spent some time studying the spider fauna in the ancient woodland of Oxleas Wood (Milner 1988), the writer wished to make a similar study in this more ordinary and well-used piece of urban woodland. A similar regime of pitfall-trapping was planned so that some comparison of results could be possible.

Regular sampling of spiders in the litter layer was conducted by using pitfall traps of a standard type and size (Milner 1987) set in groups of three in a triangular configuration approx. 1m apart. A small quantity of commercial ethylene glycol (antifreeze) mixed with a little detergent (washing-up liquid) as a wetting agent was put in the traps. The fluid was re-used once or twice depending on the rainfall and then replaced. Some of the groups of traps were provided with small zinc roofs to prevent excessive rain and dead leaves filling the traps. Even so they were occasionally full when checked. Care was taken

when emptying the traps to disturb and trample the area around them as little as possible. On a few occasions one or more traps had been vandalised, or used as a latrine by an unidentified canid, domestic or wild.

The trap sites were chosen to give a range of types of ground vegetation found in the Wood, though not necessarily in the same proportion as occurs in total throughout the Wood. It was thought that in doing this the chosen sites would represent different levels of disturbance, something that is difficult to measure, but could be roughly estimated by inspecting the amount of wear and tear shown by the vegetation and the adjacent paths (Figure 2).

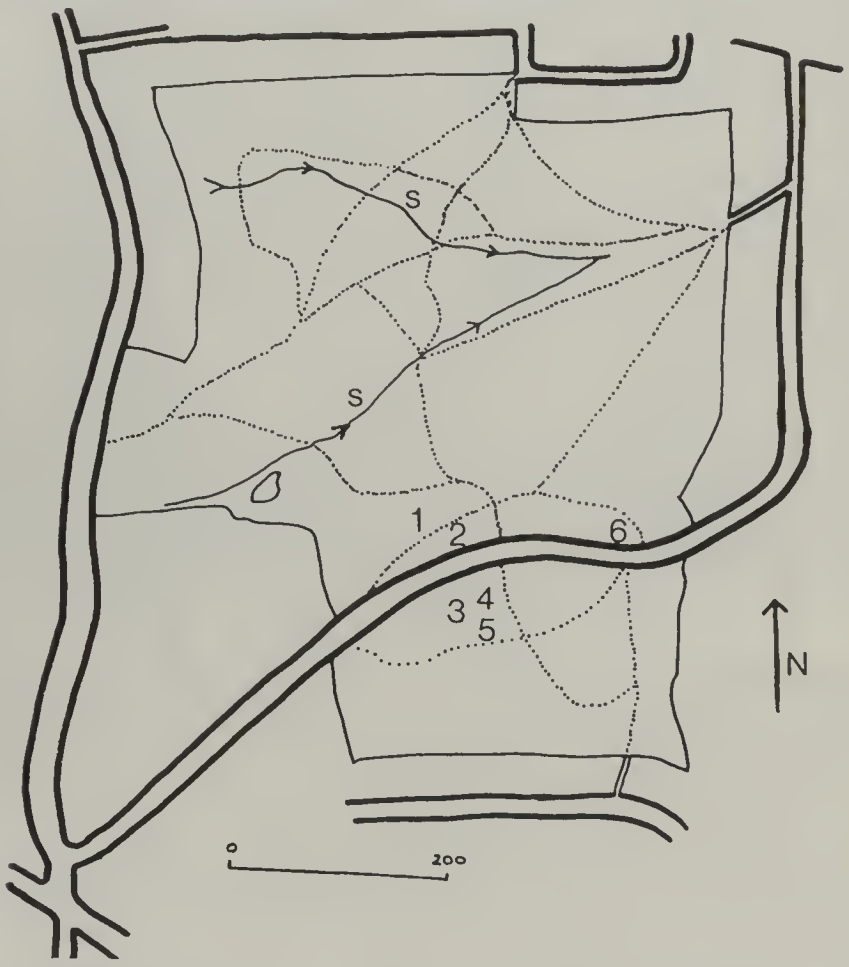

FIG. 2. Plan of Queen's Wood showing trap sites. 1 — NORTH, 2 — GRIDS, 3 — TREE, 4 — BRAMBLE, 5 — GRASS, 6 — CLEARING. S = stream. Scale in metres.

During the course of the study period severe gales removed a number of major limbs from oak trees adjacent to some of the trap sites, as well as bringing down several other mature trees. Evidence of disturbance was provided by the frequent finding of litter, small abandoned personal effects and so on, at or near to the various trap sites.

The classification of the spiders follows Merrett, Locket and Millidge (1985).

The Sites

A. South of the east-west road which bisects the Wood

1. TREE. In deep leaf litter around the base of a mature oak in a relatively

dense part of the Wood close to mature hollies and hornbeams. Zinc roofs were used here. Close to an unofficial path, *i.e.* quite disturbed.

2. BRAMBLE. Within an area of low bramble and grass *Holcus mollis* at the edge of a clearing caused by a well-established break in the Wood's main canopy. Zinc roofs were used here. A short distance from a path, but relatively undisturbed due to the growth of the brambles (Figure 3).

FIG. 3. Queen's Wood. BRAMBLE site looking west, early April.

B. North of the road

3. NORTH. In the centre of a sparsely grassed clearing under a minor break in the canopy caused by the death of a mature hornbeam whose stump is still present. The grasses present are *Holcus mollis, Agrostis tenuis,* and *Festuca gigantea.* The most disturbed site (Figure 4).

FIG. 4. Queen's Wood. NORTH site in May, showing typical disturbance.

4. GRIDS. In deep leaf-litter 3 metres from the base of a mature oak. The traps were under about 6cm of leaf-litter and so each was covered with a 6″ × 6″ section of gardeners' plastic netting (1cm sq. mesh) to prevent the leaf-litter falling into them. Zinc roofs were not used at Sites 4 and 5 as they are very close to a well-used tarmac path. The roofs were thought likely to attract unnecessary attention from other users of the Wood, human and others. A disturbed site that often has dogs running across it, though not so much as NORTH site.

Originally another site was selected in deep litter on the south side of the road but, as this was repeatedly vandalised in the first few weeks, even though not easily visible, the GRIDS site was chosen instead. As a result trapping did not start until August, when the CLEARING site was chosen as well.

5. CLEARING. Among taller grass, oak saplings, brambles and other vegetation, in a very open clearing at the side of the road. The same grass species are present as at the GRASS site. Disturbed, as a rough path has been made through the vegetation at this point, though probably less disturbed than the NORTH site.

In addition a sixth site was established at the end of the second summer in one of the less-disturbed clearings.

6. GRASS. In a dense grass sward mainly *Agrostis tenuis* and *Holcus mollis* near a mature oak in a more open part of the wood. The results from this site are not included in the main analysis as these traps were set only from 20 May 1989 and therefore there is less than one year's data from this site. Relatively undisturbed (Figure 5).

FIG. 5. Queen's Wood, near to GRASS site. Fallen branches and oak seedlings emerging where the canopy has been breached.

The traps were emptied at 2-3 week intervals, the period being counted as TN (trap-nights), being the number of nights times the number of traps. In Table 3 the trap trios times the number of nights is given: to get the TN totals multiply by 3. The main period of study for five trap sites TREE, GRIDS, NORTH, BRAMBLE, and CLEARING, was the period April 1988 to April 1990. This was divided into Years 1 and 2, each being April to April. The site GRASS started later and the period of one year for this site was May 1989 to May 1990.

In addition to the pitfall trapping some hand searching, sweep-netting, and litter sorting were done periodically, but not on a regular or systematic basis.

Results

A total of 76 species of spider has been recorded from the wood by all methods of which 49 (64%) were linyphiids. In addition, one species of hymenopterous parasite *Acrodactyla degener,* and two species of pseudoscorpion, have been recorded. The pitfall catches at the five principal sites produced 60 species. This compares with 66 species from trapping at the woodland sites in Oxleas Wood (ignoring one, the Site Pond, that differed from the true woodland sites) as reported by the writer in *L.N.* **67.** On the other hand the total species list for Oxleas Wood is at present 91 (*Oedothorax gibbosus* and *tuberosus* now being considered one species), which is very probably an underestimate. The Oxleas Wood pitfall sites were all relatively shaded, whereas the Queen's Wood sites include shaded and unshaded sites; in other words the difference between the two woods is probably greater.

As might be expected most of the spiders found were common, even ubiquitous species, but a few are worthy of note as being uncommon spiders in the London Area. A male *Syedrula innotabilis* was taken from the bark of an

oak: this is a new record for Middlesex. Other finds of interest were single specimens of *Hahnia nava* (male, December), *Erigonella hiemalis* (female, April), *Walckenaeria cucullata* (two males, May) and *Drapetisca socialis* (both sexes, October). A single male of *Moebilia penicillata* was taken from the bark of a mature oak in April: this appears to be fairly widespread in the London Area although it was first recorded from Bostall Heath (London), and Big Wood, Hampstead (Middlesex) only within the past twelve months. A single female *Lepthyphantes alacris* was taken in a pitfall at the BRAMBLE site in March; this is only the second record of this species for Middlesex.

More remarkable than the occurrence of these relatively uncommon species was the presence in large numbers of what are known to arachnologists as 'weed' or ruderal species not normally found in woodland at all.

Pitfall Trapping

For the two-year period at the five principal sites, a total actual catch of 3,273 spiders (59 spp.) was made. When a correction is made for the absence of the GRIDS and CLEARING traps during the period April to August 1988, the total is 3,496. This is a high figure, and the totals for the two years give very similar mean scores of 3.24 and 3.25 spiders per 10TN (trap-nights). This is nearly twice the figure for Oxleas Wood and almost three times the figure for Alexandra Park (woodland sites), as shown in Table 1. The proportion of linyphiids in the catch is also higher.

Details of the total catch for different sites are given in Table 2, and details of the aggregated catches for the principal species throughout the two-year period are given in Table 3a (Year 1) and 3b (Year 2). The principal species are separated by site in Tables 4a and 4b, while Table 5 compares basic data from Queen's Wood with that from Oxleas Wood.

On the basis of this study, the corrected scores indicate a peak in activity (and therefore it is assumed, numbers) during April-May in Year 1 and during May-June in Year 2, with a smaller peak during July-August in Year 1. The secondary peak in the winter that was found at Alexandra Park and at Oxleas Wood in earlier years did not occur at Queen's Wood in the two (very mild) years sampled.

The fauna can be divided into three groups of species on the basis of data from the five principal sites:

1. Species occurring at all five sites: 'ubiquitous'	14 spp.
2. Species occurring at less than five sites, but in some abundance: 'common'	19 spp.
3. Species occurring as less than five individuals during the two-year period: 'rare'	26 spp.

Most of the 'ubiquitous' species are woodland species in the London Area, such as *Macrargus rufus, Micronetа viaria, Walckenaeria acuminata,* and *Lepthyphantes flavipes,* but among this group are also two species, *Bathyphantes gracilis* and *Diplocephalus latifrons,* which are not strictly woodland spiders to the same extent, being both found more commonly in other habitats.

While most of the species scored similarly in the two years others varied enormously: *Lepthyphantes zimmermanni* and *Monocephalus fuscipes* were 122 and 126 in Year 1; in Year 2 numbers of *L. zimmermanni* almost doubled (215) and those of *M. fuscipes* almost halved (58). *Diplocephalus picinus,* absent from the GRIDS site for the whole of Year 1 was the species with the highest count from that same site in Year 2, and the aggregate totals for Years 1 and 2 were 10 and 218 respectively. *Bathyphantes gracilis* also varied in total numbers between 129 and 41.

When actual trap occurrence is taken into account, *L. flavipes* scores consistently higher than other species; even in Year 2 when it was only the

fourth most abundant species its total occurrences in trap samples was still the highest.

The differences between the individual sites (Tables 4a, 4b) were striking: several species that occurred abundantly at one or two sites were completely absent from others. In both years (taking the corrected score for GRIDS), NORTH and GRIDS scored the highest numbers, NORTH in particular scoring much higher than any other site. The several species responsible for these high totals for NORTH site all scored very low or were absent from the other sites. The exception is *D. latifrons* which was also common at GRIDS: it is perhaps no coincidence that these are the two most disturbed sites as the discussion below indicates. The more typical woodland species (*M. rufus, M. viaria, W. acuminata, Coelotes terrestris,* and *Lepthyphantes minutus*) tended to score better at BRAMBLE and TREE, the two least disturbed sites, and their overall numbers were lower.

The composition of the spider fauna varies during the year with successive species reaching peaks of activity in different months. Table 6 indicates which are the commonest species overall during different months. It may be an accident of recording that although total numbers are low in November, that is the month when the largest number of different species has been recorded as adults in the traps. It is important to note that even this figure (30) represents only 52% of all the trapped species.

Parasites

The larvae of hymenopterous parasites have been found on adult or subadult specimens of a number of species in Queen's Wood. A total of 8 females has been found with parasitic wasp larvae 'riders', which are probably all *Acrodactyla degener* (Shaw, pers. comm.). The host species were *L. flavipes* (August — 2, September — 1), *L. zimmermanni* (August — 1, February — 1), *L. tenuis* (August — 1), *B. gracilis* (August — 1), and *L. triangularis* (November — 2).

Pseudoscorpions

Two species, *Chthonius ischnocheles* and *Roncus lubricus,* have been found in the wood in both pitfall samples at various times of year and in litter sorts. *C. ischnocheles* appears to be a good deal more common than *R. lubricus* at the sites investigated.

Discussion

The results of this study show that while the numbers of spiders in the litter layer are high the fauna is rather species-poor, and the wood appears to lack interesting woodland species. The numbers of the typical woodland species that are present seems to be generally less than might be expected in such a wood, while several 'weed' species are common.

While there are similarities between the fauna found at Queen's Wood and that reported by the writer from Oxleas Wood, there are also some striking differences. Before trying to explain these differences a note of caution is needed. One problem of this type of survey is the question of how accurate an assessment of the litter layer activity it can be. The distribution of spiders in the litter layer in a wood like Queen's wood appears to be more irregular than in a more homogeneous wood like Oxleas. The difference between the five trap sites is considerable, in numbers, species present and relative abundances. The GRASS site differs again; the numbers trapped for one year are almost the same as for NORTH (over 600) but the weed species are much less prominent and some (*Milleriana inerrans* and *Erigone atra*) are absent. The seasonal differences at all sites are so great as to make comparisons impossible except using data for complete years.

The question is, do the sites chosen in any way represent the range of sub-habitats occupied by the litter spiders, and even if they do what is the relative frequency of these different sub-habitats? The more sites that are trapped the more the aggregate scores are likely best to represent the wood as a whole, but as the species frequency varied between the two years perhaps an additional year's data would be more useful. It is clear that site NORTH is very different from the others, and many clearings in the Wood appear to be very similar to this site, but on the other hand NORTH does appear to be one of the most disturbed clearings, being close to both a major tarmac path and a short distance from the road. Taking Year 2 results and adding in the scores for GRASS (May to May), the rank order of the commonest species does not change much: the four highest totals are still *L. flavipes, D. latifrons, D. picinus,* and *L. zimmermanni.* This is in contrast to Oxleas Wood where *M. viaria* and *M. rufus* replace *D. latifrons* and *L. flavipes* in the first four, but in each case the first four species represent the same proportion of the total trapped fauna, approx. 52% of total numbers.

With reservations about the preciseness of the sampling in terms of sites chosen, some hypotheses can be suggested on the basis of these results, and the comparison with both the Oxleas Wood results and to a lesser extent the Alexandra Park woodland results.

Reference will be made to the theories of Prof. Philip Grime and others at Sheffield University (Grime 1974, etc.). Using these ideas the phenology of litter-layer species has been discussed by the author in relation to Oxleas Wood (Milner 1988).

Most of the categorisations of ecological strategy assigned to spider species there seem to hold good, but taking the results together, disturbance appears to be of considerably greater importance as an ecological factor at Queen's Wood. Unfortunately there is no appropriate method or indeed objective qualitative method for assessing this, and it is based on unquantified personal observations. Suffice it to say that on few of the total occasions of trap-collection at Oxleas Wood were other members of the public encountered; at Queen's Wood the writer found that invariably there were other people and dogs in the wood on his trap-collecting visits, and frequent and abundant evidence of disturbance was almost always provided by the profusion of litter, piles of fly-tipped rubbish, personal effects, disposable fast-food wrappings, discarded mattresses, boxes and even one worn and faded armchair.

Queen's Wood is a well-used public space which is subject to a good deal of constant disturbance from people and dogs at all times of year. Until recently there was a dense canopy shading much of the ground. The ground flora is sparse and species-poor, and the spider fauna while abundant is poor in woodland species. Several of the most common species are widespread 'ruderal' spiders that can be found on many areas of disturbed land in the London Area. In particular *Diplocephalus latifrons, Erigone dentipalpis, E. atra, Milleriana inerrans* and *Tiso vagans* are all more or less ubiquitous species typical of disturbed habitats, grass and wastelands, but not typical of long-established woodland. They are what Duffey (pers. comm.) refers to as 'recreation ground species'. However they are all common at Queen's Wood, especially at the NORTH site in a highly disturbed clearing (Figure 2), and their large numbers are mainly the cause of the high total catches from Queen's Wood as compared with Oxleas Wood (Table 7).

In terms of numbers, ruderal species make up about 30% of the litter fauna at Queen's Wood; around 1% at Oxleas Wood. The likely explanation is that these species are less able to cope with the conditions of disturbance at Queen's Wood. The figures for Alexandra Park Wood are intermediate which accords with this theory; the wood though dense is rather small, so that although the litter layer is not very disturbed, nowhere in the wood is very far from a path.

The other two ecological factors emphasised by Grime and his team are stress, by which they mean environmental stress: in Queen's Wood this may be represented by shade and other specific features of the woodland litter habitat, and competition with other species for food. The characteristic phenology of the competitor is a stenochronous one, with the main activity being observed when the major prey species (insects, Collembola, etc.) are most active, while the stress-tolerant species could be exemplified in the wood by the winter-active species. Less specialised species with strategies that are intermediate between the three extremes are characteristically eurychronous, that is with adults active at all times of year (Table 3), and indeed no species exhibits only one tendency, although some appear to be much more specialised in their strategy than others.

Taking the first three species that can be clearly assigned to a type, the occurrences are given in Table 6. Most of the commoner species are the same as for Oxleas Wood: *Lepthyphantes flavipes* and *L. zimmermanni* (both common woodland species in this part of England) together make up around 24% of the catch in both woods, and among the other common woodland species *Macrargus rufus, Microneta viaria* and *Coelotes terrestris* are prominent in both woods, though more so at Oxleas Wood. Apart from these species, together with *B. gracilis* and *D. picinus* discussed below, the lists for the two woods are rather different.

Using Grime's terms, if the lists of principal species for the two woods are compared the most noticeable difference is the relegation of the stress-tolerant species (winter-active) to a subsidiary, even minor place in the fauna of Queen's Wood. Comparing the twenty most frequent species for the two woods, there are six species of this type in the Queen's Wood list, but all except *M. rufus* are ranked 13 or lower (see first column of Table 3). At Oxleas Wood (Milner 1988) there are five in the first 13 (counting *W. acuminata* as stress-tolerant: in *L.N.* **67,** page 103, it is wrongly assigned in Table 2 to 'E' instead of 'W' as the text makes clear.) They make up just 12% of the catch at Queen's Wood, whereas at Oxleas Wood they are over 30% of the total (see Table 7).

From previous results at Oxleas Wood and Alexandra Park, *B. gracilis* was taken to be a winter-active species with a secondary peak in July. It is now thought to be an adaptable species with some pioneer ability, able to breed either in the winter (Alexandra Park 1985-6) or winter and summer (Oxleas Wood 1987-8). In Queen's Wood it appears to be breeding mainly in July and August. Possibly this variability in breeding season between Queen's Wood and Alexandra Park Wood, two sites only a mile or two apart (or between seasons four years apart) may be one of the facets of its pioneer or ruderal behaviour. It is certainly a wide-ranging and adaptable species occurring throughout the country and in Scotland being found at high altitude in very exposed situations as far north as Shetland, where the writer has found males to be present in June, July, October and December (see Table 8).

The variability and erratic occurrence of other species, including *Diplocephalus picinus,* are also taken to be a feature of spiders with a ruderal strategy, adapted to disturbed habitats like weeds. In 1988 the writer observed that *D. picinus* occurred in very large numbers for a very short period of time at both Oxleas Wood and at Alexandra Park (Milner 1988: 108); this study provides evidence of its variability from one year to the next. It is a woodland species however, with an extreme stenochronous occurrence; it could perhaps be characterised as a 'woodland weed'.

The occurrence of *Centromerita bicolor,* and *C. concinna* at NORTH site, (with a single *C. bicolor* at GRIDS) is interesting. These are both winter-active species in the London Area, but they are not woodland species at all. They are characteristic of open, rough ground, even lawns, so their occurrence in Queen's Wood may be associated with long-established clearings.

The comparison of the Oxleas Wood and Queen's Wood trapping suggests

that the fauna in Queen's Wood is seriously affected by the level of disturbance, as compared with Oxleas Wood. Perhaps this is inevitable in view of the very much heavier public use of Queen's Wood due to its geographical position. At present these are uninterrupted views and therefore wind corridors across wide expanses of the wood (Figure 5), and this encourages both human and wind disturbance at ground level. The results of this study suggest that as a test of ecological conditions in these London woodlands, the seasonal occurrence of litter-layer spiders is a sensitive and important indicator.

Management Implications

How can these conditions and the ecology of the wood for all animals, plants and people be improved? Somehow the total amount of disturbance needs to be reduced and the physical complexity at ground level increased.

The fall of several trees and large branches has already made a difference, and in many places small tree seedlings have started to appear in great numbers in the last year or two (Figure 3). However more could be done by active management. If some means could be found to allow certain areas to be less disturbed, promoting the regeneration of trees and the growth of the ground flora, the general appearance of the wood could be improved. Areas could be temporarily or permanently fenced off (employing appropriate natural wood palings for example) as has been done in the adjacent Highgate Wood. This might not completely deter dogs and children, but could reduce considerably wear and tear, and allow more stability of the litter layer. More flowers would have a chance to survive, the insect fauna would improve, and it is the writer's view that the spider fauna would also change as a component of a more diverse and stable ecosystem.

It is suggested that if these management proposals were followed, the likely changes would be: (1) a reduction in numbers of ruderal species and (2) an increase in numbers of winter-active and stenochronous woodland species, with a good chance that in time there would also be (3) the appearance of woodland species not so far recorded from the wood. Any such initiative would offer a most valuable opportunity to monitor these predicted changes in the fauna.

Species List

Spiders found at Queen's Wood with some comments on the occurrence of those not mentioned above. M = males, * = relatively scarce.

Families other than LINYPHIIDAE

Amaurobius similis, TREE only, M, Oct.-Feb.
Amaurobius ferox, TREE only, M, Feb.
Harpactea hombergi, TREE only, M, Apr., Nov.
**Segestria senoculata*, GRASS only, May.
Clubiona corticalis, search only.
Clubiona terrestris, all sites except GRIDS, NORTH, M, Aug., Sep.
**Philodromus dispar*, search only, May.
Pardosa pullata, GRASS only, Apr., May.
**Pardosa amentata*, CLEARING only, M, May.
Pisaura mirabilis, CLEARING only, Sep.
Tegenaria gigantea, TREE only, Nov.
**Tegenaria agrestis*, TREE only, M, Sep.
**Tegenaria domestica*, BRAMBLE only, M, Aug.
Coelotes terrestris, see above.
**Hahnia nava*, BRAMBLE only, M, Dec.
**Theridion varians*, search only, June.
Theridion mystaceum, on bark of oaks, M, May.
Theridion bimaculatum, CLEARING only, M, June.
Theridion pallens, NORTH and search (abundant), M, Apr.-June.
Enoplognatha ovata, search only, M, June, July.
Robertus lividus, BRAMBLE, GRASS, M, May-July.

Pachygnatha degeeri, see above.
Metellina segmentata, NORTH only, single M, Nov.
Metellina mengei, abundant.
Zygiella x-notata, search, dead wood, M, Mar.
Araneus diadematus, search, infrequent.
Araniella cucurbitina, search, uncommon.

LINYPHIIDAE

Provisional type assessment: R = Ruderal, W = Winter-active, C = Competitor (typically stenochronous), I = Intermediate.

Typical habitat preference in London Area, if known: g = grassland/open ground, w = woodland/shade, m = marshy ground.

Ww	*Walckenaeria acuminata*, see above.
?Cw	**Walckenaeria cucullata*, TREE, NORTH only, M, May.
R/Cg	*Dicymbium brevisetosum*, NORTH only, M, July, Sep.
?w	*Moebilia penicillata*, on bark of oaks, M, Apr.
CM	**Gnathonarium dentatum*, GRIDS, single female, July.
Cw	*Gongylidium rufipes*, see above.
R/Cw	*Maso sundevalli*, see above.
Rg	*Oedothorax fuscus*, NORTH only.
Rg	**Oedothorax retusus*, NORTH, M, May.
Rg	*Tiso vagans*, see above.
R/Cw	*Monocephalus fuscipes*, see above.
Rg	*Gongylidiellum vivum*, NORTH only, M, Dec., June.
Rg	*Micrargus herbigradus*, all sites, M, May-July.
Ww	**Erigonella hiemalis*, NORTH only, M, Apr.
Rg	**Diplocephalus cristatus*, search, female, May.
Rgw	*Diplocephalus latifrons*, see above.
R/Cw	*Diplocephalus picinus*, see above.
Rgw	*Milleriana inerrans*, see above.
Rg	*Erigone dentipalpis*, see above.
Rgw	*Erigone atra*, see above.
Cw	*Syedrula innotabilis;* single M on oak bark, Apr.
Rg	**Meioneta rurestris*, occasional, search, M, May.
Rg	**Meioneta saxatilis*, CLEARING, GRASS, M, June.
Cg	**Meioneta beata*, BRAMBLE, search, M, Apr.
Cw	*Microneta viaria*, see above.
Ww	*Centromerus sylvaticus*, see above.
Ww	*Centromerus dilutus*, see above.
Wg	*Centromerita bicolor*, see above.
Wg	*Centromerita concinna*, see above.
Cw	*Saaristoa abnormis*, several sites, M, May-June ('88), June-Aug. ('89).
Ww	*Macrargus rufus*, see above.
?SR?	*Bathyphantes gracilis*, see above.
?SR?	**Bathyphantes parvulus*, CLEARING, female Sep.
Ww	*Diplostyla concolor*, see above.
Ww	**Drapetisca socialis*, TREE, M, Oct.
?w	**Tapinopa longidens*, CLEARING only, M, Sep.
Sw	*Labulla thoracica*, TREE and BRAMBLE, M, Aug.
Ww	*Lepthyphantes minutus*, see above.
?	**Lepthyphantes alacris*, BRAMBLE, female Mar.
R/Sg	*Lepthyphantes tenuis*, see above.
Iw	*Lepthyphantes zimmermanni*, see above.
S/Ww	*Lepthyphantes flavipes*, see above.
W/Iwg	*Lepthyphantes ericaeus*, see above.
Ww	*Lepthyphantes pallidus*, GRIDS, M, May, Feb.
Ww	*Helophora insignis*, BRAMBLE, TREE, GRASS, M, Mar.
Cw	*Linyphia triangularis*, common.
Cw	*Linyphia hortensis*, BRAMBLE, etc., M, May.
Cw	*Linyphia clathrata*, common, occasional at all sites.
Cw	*Linyphia peltata*, search only, M, Apr., May.

Hymenopterous Parasite

Acrodactyla degener, external parasite on three *Lepthyphantes* spp., one *Bathyphantes* sp. and one *Linyphia* sp.

Pseudoscorpions

Chthonius ischnocheles, TREE, BRAMBLE, Mar.-Aug.
**Roncus lubricus*, search only, Aug.

TABLE 1. A comparison of pitfall trapping at three London woodlands.
TN = Trap-nights S = spider numbers SP = species
LS = % linyphiid species * = corrected figure, see Table 2.

Location	Total TN	S	S/10TN	SP	LS
Queen's Wood (April '88-April '89)	4,758	1,545*	3.25	41: –	
Queen's Wood (April '89-April '90)	5,340	1,728	3.24	50: 59	74%
Oxleas Wood	6,804	1,295	1.90	62	62%
Alexandra Park (wood)	3,198	413	1.29	37	65%

TABLE 2. Two years, totals by site.

Year		TREE	GRIDS	NORTH	BRAMBLE	CLEARING	GRASS	Total
1	Nos	211	*153(+143)	636	213	*109(+80)	–	1,322(1,545*)
	Spp.	24	14	25	18	20	–	41
2	Nos	252	335	604	296	241	(607)	1,728
	Spp.	19	18	29	24	28	28	50

The total for Year 2 excludes GRASS site. * = traps operating only from August to April. In the comparisons below an estimated correction figure for these two sites is used by adding the numbers found in the missing months (April to July 1988) from the Year 2 figures. These give corrected figures for GRIDS of 296 and for CLEARING of 189, resulting in a corrected total of 1,545 for Year 1.

Table 3a follows –

TABLE 3a. Aggregated catch (5 sites) for Year 1. Part 1: 8 April 1988 to 26 March 1989.

		1	2	3	4	5	6	7	8	9	*	10	11	12	13	14	15	16	17	18	19	20	21	
Month		APR.				JUNE				AUG.				OCT.			DEC.					MAR.		
TN/3		70	70	85	90	80	85	65	90	80	80	70	105	95	105	115	65	110	70	100	70	100	80	
	@																							
L. flavipes	E	1	1	9*	3	3	12*	5*	2*	10*	10*	7*	13*	12*	15*	9*	2*	4*	1*	3*	1*	3*	—	126
D. latifrons	S	3*	10*	27*	29*	12*	5*		4*	7*	6*	2*	1	6*	4*	5*	4*	3*	2*	2*	2*	35*	16*	185
L. zimmermanni	E	2*	1	3	2*	2*	5*	10*	5*	12*	12*	17*	12*	8*	2*	2*	3*	3*	2	1	—	1	—	105
M. rufus	W	5	6	4	2	—	1	—	6*	—	—	—	2*	3*	2	—	—	5*	19*	41*	7*	3*	4	110
D. picinus	SS	—	—	—	4*	3*	2*	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	10
M. viaria	S	13	14*	35*	7*	—	—	1	1	2*	2*	—	1	2*	4*	1	—	—	1*	2*	—	—	4*	90
L. tenuis	E	—	—	1*	2*	2	9*	11*	4*	12*	12*	10*	3*	—	14*	4*	—	—	1*	—	—	—	1	86
M. fuscipes	S	25*	22*	15*	2	—	—	—	3*	1	—	—	—	1*	3*	3	1*	1	—	1*	1*	8*	19*	106
B. gracilis	?	—	—	—	1*	1*	5*	5*	15*	13*	13*	18*	7*	1	3*	3*	13*	16*	2*	1*	—	1*	6*	124
T. vagans	S	—	20*	12*	15*	1*	6*	3*	2*	2	1	2	1	—	2	2*	—	—	—	—	—	—	1	70
M. inerrans	S	—	7*	2*	2*	2*	9*	1*	4*	12*	12*	4*	2*	3*	1	—	—	—	—	—	—	—	1*	62
E. dentipalpis	E	—	—	—	—	—	1*	5*	6*	11*	11*	1*	1	2*	—	1	1	8*	4*	—	2*	4*	—	58
C. sylvaticus	W	—	—	—	—	—	—	—	—	—	—	—	—	—		1*	4*	10*	3*	2*	—	—	—	20
Co. terrestris	W	—	—	—	—	—	—	—	—	1*	1	15*	8*	1	4*	—	—	—	—	—	—	—	—	30
E. atra	E	—	—	—	—	1*	1*	—	1*	4*	4*	1*	1*	1*	1*	1*	—	1*	—	—	2*	—	—	19
W. acuminata	W	2	—	—	—	—	1	—	—	1	—	—	—	—	—	—	—	3*	2*	2*	1*	1*	—	12
L. minutus	W	—	—	—	—	—	—	—	—	—	—	1	—	—	3*	—	2*	5*	—	—	—	—	—	11
P. degeeri	S	—	4*	2*	1	—	—	1	—	—	—	—	1	1	—	—	1*	—	—	—	—	1*	2*	14
D. concolor	E	—	—	—	—	—	—	—	—	1	—	—	—	—	1*	1*	—	—	1*	1	—	—	—	5
L. ericaeus	E/W	—	—	—	—	—	—	1*	—	—	—	—	—	1	2*	8*	3*	2*	—	—	—	1*	—	18
C. bicolor	W	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1*	3*	2*	1*	—	—	1*	—	8
C. concinna	W	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	—	—	—	—	—	—	3
Others		3	1	5	2	5	3	1	—	2	1	2	1	5	3	5	2	1	1	3	1	1	1	41
Total		54	86	115	72	32	60	44	53	92	85	80	54	47	67	47	39	64	40	59	17	60	55	total: 1,322
Corr. to 300TN		77	122	135	80	40	71	68	59	115	106	114	51	49	64	41	60	58	57	59	24	60	69	

@ = presumed Phenological type. S = Stenochronous (SS = extreme), E = Eurychronous, W = Winter-active. * = catch No. 9 for a six-week period and has been split into two columns so as not to distort the Table. TN = Trap-nights.

TABLE 3b. Aggregated catch for Year 2. Part 1: 9 April 1988 to 17 March 1990.

	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	
	APR.				JUNE				AUG.					OCT.			DEC.			FEB.			
TN/3	70	70	65	70	70	65	70	80	80	60	65	70	85	95	95	100	115	100	90	85	75	100	
L. flavipes	19*	22*	10*	11*	17*	7*	16*	14*	21*	10*	15*	5*	5*	4*	7*	4*	1*	4*	2*	7*	2	1	204
D. latifrons	45*	22*	18*	72*	25*	10*	9*	10*	5	16*	6*	2*	1	3*	1	2*	–	4*	2*	–	4*	7*	264
L. zimmermanni	7*	10*	4*	16*	22*	21*	18*	14*	15*	15*	21*	9*	5*	6*	12*	2*	1	2	2	–	5	8*	215
M. rufus	1	2	1	3	1	–	–	–	1	–	–	–	–	2*	1*	2	2	4*	20*	23*	3*	3*	69
D. picinus	–	–	5*	69*	110*	23*	7*	–	3	–	–	–	–	–	–	1	–	–	–	–	–	–	218
M. viaria	24*	28*	15*	23*	9*	–	–	–	3	1	1	3	1	2	–	2*	–	–	–	1	–	19*	132
L. tenuis	–	1*	–	1	–	7*	15*	21*	14*	9*	2	1*	–	–	–	–	–	–	–	–	–	–	71
M. fuscipes	24*	14*	5*	5*	–	1	–	–	–	1	–	–	–	–	1	–	–	1	–	–	1*	5*	58
B. gracilis	4*	1*	1*	1	1*	5*	7*	6*	8*	2*	1	1	–	–	–	1	1*	1*	–	–	–	–	41
T. vagans	11*	12*	7*	18*	1*	5*	1*	3*	5*	2*	–	–	–	–	–	–	1*	–	–	–	–	1*	67
M. inerrans	5*	1*	5*	5*	1*	1*	4*	5*	11*	19*	7*	1*	–	–	1	–	–	–	–	–	–	1*	67
E. dentipalpis	1*	2*	3*	7*	3*	1*	5*	10*	15*	6*	5*	–	–	–	–	–	–	–	–	–	–	–	58
C. sylvaticus	1	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	3*	3*	1*	–	–	9
Co. terrestris	–	–	–	–	–	–	–	–	1*	–	–	1*	3*	–	5*	–	–	–	–	–	–	–	10
E. atra	1	1*	–	–	–	–	1*	6*	6*	2*	2*	–	–	–	–	–	–	–	–	–	–	–	19
W. acuminata	3	–	–	3	1	1	4	–	–	–	–	–	–	–	–	–	–	2*	–	–	–	2*	16
L. minutus	–	–	–	1	–	–	–	–	–	–	1	–	1	2	5*	3*	1	3*	4*	–	–	–	21
P. degeeri	3*	4*	3*	3*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	14
D. concolor	–	–	–	1	–	–	–	–	1	9*	3	2	4	–	–	–	–	–	–	–	–	1	21
L. ericaeus	–	1*	–	–	–	–	1*	–	1*	1*	1*	3*	–	–	–	–	–	–	–	2	–	–	10
C. bicolor	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	7*	7*	–	3*	1	1	19
C. concinna	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1*	–	10*	–	–	–	12
Others	10	3	3	5	10	19	19	3	6	2	2	3	6	4	5	–	2	2	1	1	3	4	113
Total	159	124	80	246	202	101	107	92	116	95	67	31	26	23	38	17	17	33	45	38	19	53	total: 1,728
Corr. to 100TN	227	177	123	351	289	155	153	115	145	158	103	44	31	24	40	17	15	33	50	45	25	53	

TABLE 4a. Catches separated by trap site, Year 1.

Species	TREE	GRIDS	NORTH	Trap Sites BRAMBLE	CLEARING	TOTAL	CORR*
1. *D. latifrons*	5	47(+62)	130	3	—(+2)	185	249
2. *L. flavipes*	32	30(+30)	18	30	16(+28)	126	184
3. *B. gracilis*	1	—(+1)	106	1	16(+4)	124	129
4. *M. fuscipes*	34	18(+15)	31	22	1(+5)	106	126
5. *L. zimmermanni*	43	7(+7)	9	36	10(+10)	105	122
6. *M. viaria*	32	6(+23)	16	33	3(+9)	90	122
7. *M. rufus*	13	33(+3)	11	42	11	110	113
8. *L. tenuis*	3	2(+2)	58	4	19(+5)	86	93
9. *T. vagans*	—	—	70	—	—(+1)	70	71
10. *M. inerrans*	—	—	61	1	—	62	62
11. *E. dentipalpis*	—	1	57	—	—	58	58
12. *Co. terrestris*	6	—	—	24	—	30	30
13. *C. sylvaticus*	2	2	6	4	6	20	20
14. *E. atra*	—	—	19	—	—	19	19
15. *L. ericaeus*	1	1	2	1	13(+1)	18	19
16. *P. degeeri*	—	—	12	—	2(+2)	14	16
17. *W. acuminata*	5	1	—	5	1(+1)	12	13
18. *D. picinus*	3	—	5	1	1	10	?
19. *L. minutus*	11	—	—	—	—	11	11
20. *M. herbigradus*	1	1	6	—	1	9	11
21. *D. concolor*	—	2	1	—	2	5	7
22. *C. bicolor*	—	—	8	—	—	8	8
23. *S. abnormis*	6	—	1	—	1	8	8
24. *C. dilutus*	4	1	—	—	—	5	5
25. *C. concinna*	—	—	3	—	—	3	3
Others	9	1	6	6	6	28	?28
Totals	211	153	636	213	109	1,322	1,545

* = corrected figures for the 1988-1989 12-month period, see above.

TABLE 4b. Catches separated by trap site, Year 2.

Species	TREE	GRIDS	NORTH	Trap Sites BRAMBLE	CLEARING	TOTAL	GRASS
1. *D. latifrons*	8	77	174	3	2	264	44
2. *D. picinus*	4	101	15	27	71	218	101
3. *L. zimmermanni*	99	11	9	76	20	215	16
4. *L. flavipes*	48	59	15	42	40	204	172
5. *M. viaria*	24	27	7	60	14	132	38
6. *L. tenuis*	4	4	53	1	9	71	29
7. *M. rufus*	5	11	7	31	15	69	51
8. *T. vagans*	1	—	65	—	1	67	46
9. *M. inerrans*	—	—	66	—	1	67	—
10. *M. fuscipes*	12	18	14	9	5	58	34
11. *E. dentipalpis*	—	—	58	—	—	58	1
12. *B. gracilis*	—	1	36	—	4	41	2
13. *L. minutus*	18	3	—	—	—	21	—
14. *D. concolor*	—	15	1	—	5	21	5
15. *E. atra*	1	—	18	—	—	19	—
16. *C. bicolor*	—	1	18	—	—	19	1
17. *M. sundevalli*	—	—	1	2	15	18	—
18. *W. acuminata*	—	1	2	12	1	16	8
19. *M. herbigradus*	—	—	8	4	3	15	5
20. *P. degeeri*	—	—	12	—	2	14	6
21. *G. rufipes*	—	—	—	—	12	12	—
22. *C. concinna*	—	—	12	—	—	12	1
23. *Coe. terrestris*	6	—	—	4	—	10	2
24. *L. ericaeus*	1	2	2	—	5	10	1
25. *C. sylvaticus*	1	1	1	4	2	9	26
26. *S. abnormis*	5	1	—	1	2	9	1
27. *H. insignis*	—	—	—	4	—	4	1
28. *C. dilutus*	—	—	—	2	—	2	—
Others	15	2	10	14	12	53	16
Totals	258	338	604	296	241	1,728	607

TABLE 5. Comparison of numbers trapped in Queen's Wood (Years 1 and 2), with one year at Oxleas Wood. N = numbers. O = Occurrences (appearance in catches at trap sites). * = Oxleas Wood figures for five woodland sites, not including POND, April-April.

Species	Queen's Wood 1988-1989		Queen's Wood 1989-1990		Oxleas Wood* 1987-1988		QW	OW
	N	O	N	O	N	O	N/O	N/O
L. zimmermanni	122	50	219	60	209	66	3.1	3.2
L. flavipes	184	60	208	68	90	47	3.1	1.9
D. picinus	10	?	218	22	163	15	(7.9)	10.9
B. gracilis	129	27	41	17	7	5	3.9	1.4
D. latifrons	249	45	265	43	2	2	5.8	1.0
M. fuscipes	126	36	69	25	5	4	3.2	1.25
M. viaria	122	40	134	37	205	40	3.3	5.1
M. rufus	113	37	77	32	121	35	2.8	3.5
W. acuminata	13	11	16	10	110	59	1.4	1.9
Coe. terrestris	30	7	12	6	64	23	3.2	2.8
L. tenuis	93	25	71	17	8	7	3.9	1.1
L. ericaeus	19	10	10	9	2	2	1.5	1.0
T. vagans	71	14	67	14	—	—	4.9	
M. inerrans	62	14	67	15	—	—	4.4	
E. dentipalpis	58	14	58	11	—	—	4.6	
E. atra	19	11	19	7	—	—	2.1	
L. minutus	11	4	21	11	3	3	1.9	
D. concolor	7	5	21	14	10	3	1.5	3.3
C. sylvaticus	20	14	9	7	3	2	1.3	1.9
C. dilutus	5	4	2	1	28	19	1.4	1.5
H. insignis	1	1	5	4	40	21	1.2	1.9
H. helveola	—	—	—	—	13	10		1.3
C. bicolor	8	5	19	5	—	—	2.7	

TABLE 6. Queen's Wood: Pitfall catches by month.

Month	No. of spp.	Highest nos.	Most occurrences
1 January	21	*M. rufus*	*C. sylvaticus*
2 February	20	*M. rufus*	*M. rufus*
3 March	22	*D. latifrons*	*M. fuscipes*
4 April	23	*M. fuscipes*	*M. fuscipes*
5 May	31	*D. latifrons*	*M. viaria*
6 June	26	*D. picinus* (1988: *D. latifrons*)	*D. picinus*
7 July	24	*L. flavipes*	*L. flavipes*
8 August	28	*L. zimmermanni*	*L. flavipes*
9 September	27	*L. flavipes*	*L. zimmermanni*
10 October	22	*L. flavipes*	*L. flavipes*
11 November	30*	*L. flavipes*	*L. flavipes*
12 December	17	*B. gracilis*	*L. flavipes*/*C. sylvaticus*

* = The month with the highest no. of species.

TABLE 7. Contrasting catches for (a) some ubiquitous (ruderal) species and (b) some winter-active species in pitfall catches from three London woods.

Species	Queen's Wood	Oxleas Wood	Alexandra Park (woods)
(a) Ruderal species			
D. latifrons	436 (14%)	2	absent
M. inerrans	129 (4.1%)	absent	absent
E. dentipalpis	116 (3.8%)	absent	3
E. atra	38 (1.2%)	absent	absent
Oedothorax fuscus	3	absent	1
(b) Winter-active species			
W. acuminata	30 (1%)	117 (9.1%)	24 (5.9%)
H. insignis	6 (0.2%)	34 (2.7%)	6 (1.5%)
C. dilutus	9 (0.3%)	26 (2.0%)	—
H. helveola	—	12 (0.9%)	—
Total nos.	3,086	1,279	409

TABLE 8. Comparison of phenological data of species found in three London woods. (Mm = month with highest catch of males)

Species	Queen's Wood Mm	Oxleas Wood Mm	Alexandra Park Mm
1. Eurychronous species (Intermediate strategy)			
L. flavipes	various (Apr.-Aug.)	June	August
L. zimmermanni	various (Apr.-Nov.)	August	Aug.-Nov.
2. Stenochronous species (Competitor/ruderal)			
D. picinus	May-June	May	May-July
M. viaria	April	May	May
3. Winter-active species (Stress-tolerant species)			
M. rufus	February	February	absent
C. sylvaticus	January	December	—
W. acuminata	Jan.-Feb.	January	January
4. Anomalous (? ruderal)			
B. gracilis	July-Sept.	December	December

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Book Review

Plant Hunting for Kew. Edited by F. Nigel Hepper. H.M.S.O., 1989. 222 pp. £17.95, paperback. ISBN 0 11 250038 2.

David Attenborough's foreword starts 'The heroic days of plant collecting are famous and the name of Kew echoes through them', but does this book justify the assertion at the end that 'The heroic days are by no means over'? Certainly there are still discoveries to be made, but not on the grand scale of the earlier times described in the opening chapters by Ray Desmond. The bulk of the book consists of accounts of their own travels by living staff or former staff. These vary greatly in style and quality, but all have in common handsome photographic illustration. There are even four double spreads of photographs with no corresponding text, which help to dispel any impression of barrel-scraping which might be got from too close a reading of the text, where one might notice for instance that Meikle's collecting in Cyprus was done before the partition of that island a quarter of a century ago.

R. M. Burton

Book Reviews

Nature's Night Life. By Robert Burton. £7.95. ISBN 0 7137 2129 4.

Birds in the Garden. By Mike Mockler. £8.95. ISBN 0 7137 2119 7. Both 160 pp. in paperback. Blandford Press, London, 1989.

Nature's Night Life covers all parts of the animal kingdom including insects, spiders, fish, mammals, reptiles and birds, which are active at night. The faunas described are from all areas of the world and covered systematically in chapters entitled 'Birds of the Night', 'Bats', 'The African Savannah', 'Deserts', 'The Seas', etc.

There are fine photographs, some in black and white, others in colour. I particularly liked those of long-eared bats in flight, a serotine catching a hawkmoth, and a leopard relaxing in a tree. Some of the aquatic denizens are depicted in glorious colour which is very pleasing to the eye.

Robert Burton and the publishers are to be congratulated on producing a really absorbing natural history, and I have no hesitation in recommending purchase.

Birds in the Garden is another first class book from Blandford, which should encourage bird-watching from the kitchen window, and hopefully start the novice going into the countryside fired with enthusiasm to observe there as well, whilst the seasoned naturalist will find it engaging.

The subject is dealt with comprehensively, having chapters on courtship and nesting, eggs and young birds, seasonal variations, death, dangers and protection, and identification. There are numerous colour photographs of our favourite feathered friends.

Every conceivable aspect of birds' lives is brought into focus. For example the note and care of feathers, and the length of a bird's day. Migration, the impact of weather conditions, predation and many other topics are discussed in depth.

This is a book which satisfies the need for one on garden birds that gives a more detailed and interesting treatment of the subject than the usual identification guides. Our thanks are therefore due to Mike Mockler and I hope that readers of this review will now go out and buy what is a reasonably priced book.

R. V. Goulding

Spider Records for the London Area for 1989-1990

by J. Edward Milner*

Introduction

Undoubtedly the most interesting spider find in the counties of London and Middlesex during the past 12 months has been the discovery of *Zodarion italicum* under stones at the Parkland Walk Extension at the side of Finsbury Park (Middlesex), an area which is being demarcated as a conservation area. *Z. italicum* was first reported in Britain by Peter Harvey who discovered a colony of this attractive little black spider at Grays Chalkpit in 1985. He has since found it to be very common at many sites in the Grays area, and has recently found a specimen in grassland at Hadleigh near Southend. Another arachnologist has found one at Sheerness in Kent (P. Harvey pers. comm.). The Parkland Walk specimen is the first record of an adult in the London Area. A second immature specimen was also found recently by the writer in a collection made in 1985 at The Willows, Tottenham (TQ345889), about two miles from Parkland Walk. The site has since been partly destroyed by British Rail.

During the year a number of new sites in London and Middlesex that had not previously been investigated for spiders were visited by the writer, the more interesting ones being Stanmore Common, Monken Hadley Common, Big Wood and Turner's Wood in Hampstead (all Middlesex) and Primrose Hill (London). Further visits were made to Barnes Common and Putney Heath (both London) which are proving to be excellent sites, and Society field-trips are now planned to both of them. Over seventy species have already been found at Barnes Common from just a few visits in the early part of the year.

In view of the changes in the active spider fauna through the seasons it is clear that several visits at different times of year are needed to get a true picture of the fauna at any particular site. This is evident from some of the new records given below, most of which are for early months in the year which are often not an easy time for collecting. The species that are active during this period are often overlooked. In the hope of correcting this the writer has tried to do more winter fieldwork and the reward has been a number of interesting finds. In particular the new London records of *Panamomops sulcifrons* and *Porrhomma microphthalmum* at Regent's Park and *Archaearanea lunata* at Barnes Common are most interesting, as is the find of *Erigone vagans* at its second site in London. A new record for Middlesex has been the recording of *Lepthyphantes alacris* at both Stanmore Common and Queen's Wood, Highgate.

All records are by the author and the identifications in most cases have been confirmed by Dr Peter Merrett to whom I am most grateful. New records for London County are marked *, and for Middlesex **.

The classification follows Merrett, Locket and Millidge (1985).

CLUBIONIDAE

Several female specimens of *Agroeca proxima**, a large reddish clubionid, were found among grass and leaf-litter on Barnes Common in February, 1990. This species occurs widely throughout the country, but this is the first record for London.

ZODARIIDAE

A single female *Zodarion italicum*** was found under a stone at Parkland Walk Extension in May 1990, and an immature female in a collection made at The Willows, Tottenham in 1985.

*80 Weston Park, London N8 9TB.

HAHNIIDAE

Three females of *Hahnia montana* were found in leaf-litter at Barnes Common in February, 1990. This is only the third London site after Oxleas Wood and Bostall Heath.

THERIDIIDAE

A beautiful female *Achaearanea lunata** was collected from its web on the lower branches of an oak tree on Barnes Common by Mrs J. W. Milner in May, 1990.

TETRAGNATHIDAE

Both sexes of the attractive *Tetragnatha pinicola** were swept from bushes on Putney Heath in May, 1990.

LINYPHIIDAE

Males and females of *Moebilia penicillata*** were brushed from the bark of oak trees at Big Wood, Hampstead in April, 1990, and taken subsequently from an oak tree at Queen's Wood. It seems likely that this elusive species is in fact fairly widespread, but has been overlooked until now.

Troxochrus scabriculus, first recorded for London from Bostall Heath two years ago, was found in large numbers (both sexes) in tidal debris on the Thames riverbank near Hammersmith Bridge in March, 1990. A male was also found at Putney Heath in February.

Several individuals of both sexes of the tiny (1.25mm) pale *Tapinocyba praecox** were found at Barnes Common in January and February 1990.

A female specimen of *Microctenonyx (Aulocyba) subitaneus* was identified from a collection made at The Willows, Tottenham in May 1985 and only recently examined. This has been recorded before in Middlesex, but this is the nearest site to Central London.

A single female *Micrargus subaequalis** was found among leaf-litter at Primrose Hill in London. The only previous records of this tiny spider in London or Middlesex were at Alexandra Park in 1985 and 1986.

A male *Erigonella hiemalis** was found on Barnes Common in April, 1990, and more than thirty specimens (both sexes) were shaken out of moss at Coppetts Wood (Middlesex) in January and February, 1990, and a single male was taken in a pitfall trap at Queen's Wood in April, 1990.

Two male and two female specimens of *Panamomops sulcifrons**, an extraordinary little spider with two small 'horns' at the side of the head, were extracted (using a home-made Tullgren funnel device) from leaf-litter and dead grass collected at Regent's Park in Central London in February, 1990.

Both sexes of *Erigone vagans,* 'the outstanding London spider' according to the late Theodore Savory (Savory and Le Gros 1957), have been found in vegetation at the edge of a pond on Putney Heath in early April, 1990. This is only the second genuine locality for London County, the other being Camley Street Nature Reserve near King's Cross, where further specimens have been taken in the last year.

A single male *Syedrula innotabilis*** was collected from the bark of an oak tree at Queen's Wood, Middlesex in April, 1989 and males of *Lepthyphantes alacris*** at Stanmore Common in March, as well as at Queen's Wood in April, 1989.

Two females of *Porrhomma microphthalmum** were sorted from litter at Regent's Park in February, 1990, a male taken at Stanmore Common at the end of March, 1990, and another male taken at Monken Hadley Common in April.

Taking the list published in *L.N.* **66** (Milner 1987), the additional records given from Oxleas Wood (Milner 1988), and the new records for last year (Milner 1989), the total number of species recorded for the County of London (the old L.C.C. area) now stands at 237 species or approximately 43% of the British fauna.

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Book Review

Umbellifers of the British Isles. By Sabina G. Knees. Shire Publications Ltd, Princes Risborough. 1989. 24pp. £1.95. ISBN 0 7478 0031 6.

This is No. 49 in the Shire Natural History series, several of which have been reviewed previously in *The London Naturalist*. I share the difficulty referred to by Colin Plant two years ago when reviewing No. 24, *The Lycaenidae*, of comprehending who the book in front of me is for. With more restricted subjects, like those of No. 3, *Bee Orchids*, No. 6, *Buttercups* or No. 9, *Gorse*, the small 24-page format is appropriate for a popular illustrated monograph. It does not allow space both for an account of the characteristic morphology and floral biology of the Umbelliferae, which is quite adequate though there are terminological details about which one could quibble, and for a sufficient description of all the British species, for which the *B.S.B.I. Handbook* reviewed in *The London Naturalist* No. 59 is recommended. It is a pity therefore that so many of the photographs (not the best way of illustrating these rather similar plants diagnostically) depict species rarely seen in Britain, when there are many common representatives of the family not illustrated.

RODNEY BURTON

We have since received No. 51, *The Barnacle Goose*, by Myrfyn Owen, No. 52, *The Kestrel*, by Gordon Riddle, No. 53, *The Mandarin Duck*, by Christopher Lever, and No. 54, *Mice of the British Isles*, by Michael Leach. The first three, each dealing with a single species, and the last, dealing with four species, fall into the same category as Nos 3, 6 and 9 referred to above. The result is that each is a well-balanced, popular, but scientific treatise, packed with information and superbly illustrated. Ed.

Wallchart Review

Identification Chart of British and Irish Dragonflies. Harley Books, Martins, Great Horkesley, Colchester, Essex CO6 4AH, in association with the British Dragonfly Society. 1990. 70 × 100 cm (27½ × 39⅜ ins). £4.99 (incl. VAT), postage extra, discounts for quantity orders and trade.

Many national and local museums as well as specialist organizations have for years produced detailed and scientifically-accurate wallcharts. These have covered a wide range of habitats from the seas to the mountains (and the universe) and have depicted marine and freshwater life, prehistoric scenes, mammals, birds, insects and flowering and non-flowering plants. Others have shown life-histories in graphic detail. All are attractive and, more importantly, educational.

Two years ago we reviewed on these pages an important new book, *The Dragonflies of Europe,* by Dr R. R. Askew and published by Harley Books. We now have in front of us, from the same publisher, in collaboration with the British Dragonfly Society, a wallchart of the dragonflies of the British Isles. Our reviewer in 1988, Ruth Day, summed up by saying 'The Whole ... amounts to a very impressive, elegant and meticulous piece of work'. The plates were all the work of Dr Askew and the 87 individual coloured figures used now to depict the 39 species found in the British Isles are taken from the same original water-colour paintings. Both sexes are shown for most species as well as their different colour forms. In keeping with Dr Askew's book, the Zygoptera (demoiselles and damselflies) are shown at 2.7 times life size, whilst the Anisoptera (dragonflies) are shown at 1.35 times life size. Concise and clear details of habitats, locations and status are given for each species.

With much justified concern over the loss of suitable habitats for threatened insects like the dragonflies, the publishers are to be congratulated in producing this chart which should find a place in all field-centres and on nature reserves, in the classroom and even in the naturalist's own house. Last year Steve Brooks, in writing in this journal on the current status of dragonflies in London, appealed for details of sightings from the under-recorded areas. Here is an excellent stimulus for our members, and others, to assist in filling the gaps, starting next season. I thoroughly recommend this wallchart to you.

K. H. Hyatt

Survey of Bookham Common

FORTY-EIGHTH YEAR

Progress Report for 1989

Contents

General (Geoffrey Beven†)

A new research hut, measuring 16′ × 8′, was purchased by the Society, and with the permission of The National Trust, was erected in February 1989 on a concrete base in the garden of Merritt's Cottage. The hut is under the control of the Bookham Common Committee, but is available for use by other sections of the Society. Ken Page was in charge of the moving arrangements, fixing the lining of the hut, moving in the furniture and much else. The lighting was installed by Alan Snow, whilst Brad Ashby, Arthur Piper and Ian Swinney helped in many ways.

We are sorry to report that Dr Alan M. Easton died in 1989. He was a general medical practitioner in Bookham. For some years he was chairman of The National Trust Committee for Bookham Common. A keen naturalist, he was a Fellow of the Royal Entomological Society and since 1944 a member of the L.N.H.S. Making a special study of beetles, he published five papers on the beetles of Bookham Common in *The London Naturalist* between 1946 and 1952 and described the habitat in which each species was found. He was very helpful in many ways and would discuss National Trust work on the Common and its effect on conservation. An obituary appears on p. 145.

Management Tasks on Bookham Common, 1989 (Ian F. Swinney,* National Trust Warden)

When reporting the management work undertaken during 1989 it is worth considering the reasons for such interference.

If left alone the Commons would rapidly become continuous woodland

†Deceased. An obituary appears on p. 147.
*Merritt's Cottage, Great Bookham Common, Leatherhead, Surrey KT23 3HZ.

dominated by pedunculate oak *Quercus robur* with only a limited number of associated species. Studies by the Survey have shown this to be happening already. The reasons for this change are also well documented: the lack of grazing by domestic animals and rabbits, the decline in coppice management and demand for firewood. Traditional management superseded the effects of early wild animals (elk, aurochs, wild boar and beaver) which must have had a considerable effect on the British landscape. It could be argued that we are trying to imitate pre-Bronze Age woodland, which would have been extensively grazed, with dead trees (fallen and standing) and a broad age range down to young saplings, able to grow only with the protection of scrub species. Woodland such as this would provide a home for a great variety of wildlife.

If a plant or animal disappears from the commons it is unlikely to re-appear quickly. There simply is no land nearby where secondary succession (which provides conditions for such a great diversity of wildlife) can take place. Therefore it is vital that we maintain and enhance the variety of habitats on Bookham Commons. The management plan identifies this requirement as being of great importance while recognising the recreational requirements of the many visitors.

So far we have been unable to acquire any specimens of the aurochs *Bos primigenius* (extinct since 1627, but re-created by back-breeding in a German Zoo) and may have trouble with the re-introduction of necessary population regulators such as the wolf and the brown bear, but major progress has been made. After an absence of 40 years, cattle have returned to Central Plain and the L.N.H.S. is making a valuable contribution towards monitoring the effects of grazing. Most of the work concerned with herbivores and their influence on plant species has been undertaken with a view to maximum livestock production/nutrition, so that there are opportunities for study with wild flower preservation as a main aim. Many of the smaller, delicate plants cannot compete with the aggressive, strong-growing grasses and the grazing should have a beneficial effect for such plants as the southern marsh orchid *Dactylorhiza praetermissa,* details of the monitoring of which appear in the following report by Bryan Radcliffe.

Clearing along the woodland edges is an important requirement due to the rapid, dynamic nature of the vegetation. With the help of boys from the Howard of Effingham School various tasks that would otherwise be a desirable aim have been implemented. The most notable project has been the enhancement of the 'edge-effect' along Common Road North, an area that has had little attentior for the past 50 years.

With the help of Ken Willmott and the British Butterfly Conservation Society the woodland edges of the Broadway, near to High Point, were cleared and planted with goat willow *Salix caprea,* the principal foodplant of the larval purple emperor *Apatura iris*. This task should ensure continuity of suitable trees for this beautiful butterfly.

Further clearance of a proportion of trees — willow carr in particular — took place in some of the important wetland sites. An area of scrub and young oaks was felled beside the wetland, where Central Ditch meets the edge of the Isle of Wight Enclosure. There are already many semi-aquatic plants emerging in the damp ground.

Upper Eastern Pond was cleared around during the summer to allow more light to the important margins. Re-colonisation here is also well advanced.

Other work has included the improvement of some of our car-parking areas and further felling and tree surgery from the storm of October 1987. Where possible the dead wood is hauled into the woods and allowed to decay naturally. Most of the work is along the path edges (for safety) and the majority of the fallen and damaged trees within the woodland will be retained.

I would like to thank everyone for their assistance over the year and look forward to a successful 1990. Please visit us and support the Survey if you can.

Vegetation (Bryan Radcliffe*)

Cattle Grazing in Division 'R'

In order to maintain, and if possible increase, the diversity of wildlife The National Trust decided to re-introduce controlled stock grazing in 1989. For this purpose a boundary fence was erected, enclosing about 5.3 ha (13 acres) of Central Plain. A range of habitats was included from open grassland through stages of scrub to incipient woodland. The area included part of the watercourse of Isle of Wight Ditch. Six cows were put on the land from 2 July to September. This was followed by nine cows on the area from late November to the end of the year.

The Bookham Survey team have established six quadrats to monitor changes in the vegetation. A permanent substantial post has been sited at the north-east corner of each. When required the quadrat is marked out with pegs and string using compass bearings from the post. All quadrats are two metres square.

The quadrats were selected, not at random, but with deliberate bias. The first two contained, respectively, 35 individuals of *Ophioglossum vulgatum* and four of *Dactylorhiza praetermissa*; local species whose behaviour was of particular interest to us. The third quadrat was in open sward subject to appreciable rabbit grazing. The fourth and six quadrats contained numerous shrub stems, mainly blackthorn: the fourth was swiped in 1988, the sixth uncut. The fifth quadrat was in a shallow depression, somewhat tree-shaded, that was known to be very wet in winter. It should be noted that no attempt was made to establish a quadrat in a favourable position likely to contain a large number of species. The quadrats were comparatively remote; no two being closer than about 40 metres.

Recording was carried out in June, July and August; successive visits being needed positively to identify some plants. Insufficient time was available to carry out any quantitative studies and it is hoped to commence this in later years. At this time recording was simply on a present/absent basis.

The six quadrats yielded a total of 164 records comprising 77 species. A remarkable feature that immediately became apparent was the considerable diversity in the quadrats: 36 species, *i.e.* almost half the total, occurred only once! The spread of these 'unique' species was uneven, from a minimum of two in the swiped scrub to a maximum of ten in the unswiped scrub, although the number of records was the same in both quadrats. There were just two species common to all quadrats: *Angelica sylvestris* and *Cirsium arvense*.

The piece of land selected for stock grazing lies entirely within Division 'R' of the Common. The area of Division 'R' is about 11.3 ha (28 acres) and during the most recent main survey a total of 247 plant species was recorded. It is curious that as many as 31% of these have turned up in the six quadrats which represent little more than one five-thousandth of the Division.

The quadrats will be monitored annually to assess the medium and longterm effects of the grazing and the results will be reported. It may well be found that, starting with comparatively rich quadrats, there is little or no increase in diversity, but we can at least be confident that change of some kind will occur.

Plants of Interest, Elsewhere on the Common

In 1979, when our population of *Carex strigosa* was thought to be in imminent danger of extinction due to pipeline excavations, we chose six safe alternative sites and planted two individuals of the population at each. As with the majority

*14 Manor Close, Burgess Hill, W. Sussex RH15 0NN.

of attempted introductions these were mainly unsuccessful, but the plants have survived at one place. This is by the stream connecting Lower Eastern and Eastern Hollow Ponds. It should be noted that the original colony survived the disturbance of the excavation.

A new record for the Common was the bullace *Prunus domestica* ssp. *insititia,* found on the west side of Central Path at 855. The plants cover an appreciable area and it is not known whether the spread is due to suckering or seedlings. Much fruit was produced in the good summer of 1989, providing additional confirmation of its identity.

In recent years two individuals of *Rosa micrantha* have been known along Hollow Path, which runs parallel to and just north of the chain of ponds. A closer look at the roses along this path revealed four more. These have certainly been present for some years but remained unnoticed until 1989.

Fungi (Pamela Goldsmith*)

The following species, new to Bookham Common, were found in 1989:

i. 7 October in Central Wood.

Pholiota squarrosa
Ganoderma lucidum
Sepedonium chrysospermum (imperfect stage of *Apiocrea chrysospermum*)

ii. 12 November in Central Wood.

Boletus porosporus

Some Exercises in Limnology (C. B. Ashby†)

Introduction

Road drainage enters the ditches and fresh waters of the Common only under conditions of exceptional rainfall. Their freedom from pollution by toxic substances renders the ponds and streams of the survey area especially suitable for study, and such subjects as the yearly cycles of the phytoplankton and zooplankton, their variations from year to year and the differences between the various ponds come immediately to mind. Other groups, as for example the colonial protozoons, the coelenterates, the rotifers and invertebrates of most other orders, are also present in variety.

Samples for microscopical examination were taken from five of the main ponds and from one of the smaller ponds on four dates in 1988 and eight dates in 1989. Usually, the method of collecting was by means of a conical net of mesh 120 threads to the centimetre, supplemented by sediment samples obtained by a weighted dredge cast out on a line. The three, sometimes four, samples taken on each of the twelve dates were seen as no more than a pilot study and a modest contribution to our knowledge of the ponds as stated by Norkett (1949) and others; notably the annual reports by John Coles.

An account of management work on the Isle of Wight Pond in 1972-1973 was given by Beven and Radcliffe (1978). A brief but spectacular efflorescence of aquatic plants in 1973 and subsequent years was followed by a decline almost to vanishing point in 1976 and 1977, and the pond has been slow to recover (Merritt 1987). Upper and Lower Eastern Ponds were discussed by Radcliffe (1978) and the former is currently undergoing scrub clearance and management. Lower Eastern Pond was described by Merritt (*loc. cit.*) as being eutrophic with abundant emergent and aquatic flora, and was one of the three ponds especially selected for damselfly study (Day 1987, 1988). Eastern and Western Hollows, shallowly excavated and reclaimed from invasive scrub in the summer of 1977, refilled naturally in the autumn of that year (Radcliffe *loc. cit.*).

*14 Mayfield Road, Wimbledon, London SW19 3NF.
†31 Tudor Close, Cheam, Sutton, Surrey SM3 8QT.

Algae

Eastern Hollow Pond was one of the ponds regularly included in the present series of twelve sampling visits, and was notable for a 'bloom' of the unicellular alga *Ceratium hirundinella*; first seen in quantity on 13 August 1989, continuing unabated on 10 September, and reduced to a barely detectable minimum by 8 October. *C. hirundinella* was abundant also in Western Hollow Pond on 13 August; but in Lower Eastern Pond only one was found in numerous samples on the date, 10 September, when it was present in the adjacent Eastern Hollow in profusion. On the days of its abundance it was outnumbering other organisms in each inspected drop by hundreds to one. Coles (1986) in September 1985 took samples from the Isle of Wight Pond, Western and Eastern Hollows and from Lower Eastern Pond; in Eastern Hollow Pond, but notably not in the others, Coles found *Ceratium* present in such vast numbers that 'the water was quite green with them'.

The genus *Ceratium* includes a number of species, mostly marine, which are spectacular when seen, in the living state, under the microscope. Occurring also in the New World, and probably cosmopolitan, these freely motile organisms were originally thought to be of the Protozoa; but are now usually accepted as being photosynthesising plants (Chapman 1941, Smith 1950). The greenish-yellow cell contents — chlorophylls and carotenes — are enclosed in a transparent silicon sheath, its 'netted' surface having the appearance of crystalline, interlocking plates. The sheath is extended to a long, tapering horn at one end; and two, sometimes three, horns — all of unequal length — at the other. Around the middle of the cell there is a deep furrow in which lies a coiled flagellum, whip-like and one of two, the other usually seen external to the furrow and frequently waving or beating. In some forms there is a light-sensitive ocellus, a bright red 'eye-spot'; a feature so far noted at Bookham only once, on 21 May 1988, and seemingly absent from the autumn multitudes. In the thin film of water between a coverslip and a microscope slide, *Ceratium* may be seen in constant motion, either in the direction of the single horn or the reverse. If viewed in slightly deeper water as, for example, a few drops in a watch-glass under a low power, a better impression of the range of movements is obtained. Restless crowds of organisms are now seen to be progressing, with the single horn leading, in a revolving or 'drilling' movement; usually parallel to the water surface, but not infrequently turning sharply into a perpendicular dive to a lower level.

Another highly motile unicellular alga is *Synura*, well represented at Bookham. Le Gros (1972) described the water of Lower Eastern Pond on 9 August 1969 as being 'green with vast numbers of the motile *Synura uvella* Ehr. It was seen later in small numbers in Bayfield Pond and in two of the gunpits, reaching abundance again in Lower Eastern Pond on 19 May 1970'. Swimming colonies of a translucent golden-green species of *Synura*, possibly *S. uvella*, were seen in three of the ponds at all times of the year, notably on 12 February 1989, when it was abundant in Lower Eastern Pond. *Synura* occurs in rivers as well as in ponds, and is described by Belcher and Swale (1979) as 'swimming colonies of pear-shaped cells joined together by their tails'. If the colony is not too dense this mode of attachment may be discerned; but some colonies, described by Smith (1950) as spherical or oblong ovoid, are so dense as to have the remarkable appearance in life of a fast-gyrating, tumbling, stalkless bunch of green grapes; except that the two flagella possessed by each cell at its free end, in combination with the flagella of the up to fifty accompanying cells, set up sufficient turbulence for still smaller floating particles to be attracted or repelled.

The concept of plants which, singly or in colonies, swim or creep under their own 'volition' is now freely accepted. Many of the hundreds of micro-algae have these attributes and some, such as the euglenoids, have 'eye-spots' as well.

Mellanby (1938) was among the first to include such free-swimming colonial flagellates as *Pandorina* and *Eudorina,* and the solitary but abundant *Chlamydomonas,* in the Algae; but retained *Euglena viridis* in the Protozoa, whilst crediting it and its congeners with the ability to 'synthesise carbohydrates like a plant'. The well-known and highly diverse diatoms (Bacillariophyceae), the sculptured silica outer sheaths or frustules of which have been studied by generations of microscopists, include both motile and non-motile species. They exist in fossil deposits, in the sea and in fresh water; samples from Bookham regularly contain them. Of these, *Gyrosigma* is usually to be obtained from silt samples and may be recognised by its elegant sigmoid shape and well-defined central raphe. It possesses no flagellum or other outward organ of locomotion, and yet may be seen to show persistent movement, travelling perhaps three or four times its own length in the direction of its major axis, then an equal or greater distance back along the path already travelled. In the course of its slow, smooth, shuttle-like progression, minute particles of plant or other debris may be seen to be thrust from its path like ice-floes before an ice breaker. This, at first baffling, performance has been explained by Müller's theory of cytoplasmic streaming (Smith 1950).

On 8 October 1989 Western Hollow Pond, unlike its neighbours, looked green from any angle at any distance. This was found to be caused by astronomical numbers of a spindle-shaped (acicular) pale green diatom, totally inert and lying so thickly on the slide as to be overlapping. On 12 March 1989 every sample taken from South-East Pond had cyclops in profusion. A hand-lens at the pond side, even the unaided eye, showed that all were of a startling bright green. This unlikely colour for cyclops was found to be due to minute, oval green algal cells covering every part of the host, even the egg-cases and appendages. In contrast, cyclops and daphnia sampled in Crater Pond on the same day were free of such clustering epibiotic algae. Similar green cells were found adhering to *Vorticella* sp., a protozoon, in South-East Pond, the transparent 'wine-glass' stems being the substrate for up to five or six cells. Le Gros (1972) recorded the presence of the alga *Amoebidium parasiticum* on water-fleas *Daphnia* in Lower Eastern Pond in mid-October, 1970. In the course of the recent sampling, epibiotic green cells were found clustering on hosts as diverse as desmids and rotifers. Of the numerous other algae encountered, suffice to mention two: a branched colony of the loricated *Dinobryon sertularia* (Chrysophyceae) in Eastern Hollow on 8 January 1989; and the desmid *Closterium aciculare,* also in Eastern Hollow, on 10 September 1989.

Protozoa

Vorticella, already noted as being the occasional host for algal cells, may in its turn be epizoic on cyclops or other invertebrates. A mated pair of *Asellus,* the water-louse, in South-East Pond on 12 March 1989 were found to be supporting active colonies of *Vorticella* sp., or a related peritrich, which appeared as a grey felt on the abdomens of both hosts. Mixed with them were a few *Stentor,* among the largest of the protozoons and just visible to the unaided eye. *Stentor* has appeared in the samples from Eastern Hollow, South-East Pond and Crater Pond in the early months of the year, and especially on 12 March 1989. A colony from South-East Pond, transferred on that date to a cavity slide and allowed to settle for an hour, numbered 89 in extended form, anchored to vegetation; still others had detached themselves and were free swimming. Such floating leaves of the annual duckweed *Lemna minor* as were present on 12 March were much favoured by this organism, up to 49 active *Stentor* being counted on the underside of one leaf.

Coelenterata: Hydrozoa

Three species of hydra are recognised by Mellanby (1938) for British fresh waters: *Hydra viridissima, H. vulgaris* and *H. oligactis.* All have been noted in

the recent samples: in January, March, May, August, October and December, although not all species have been recorded in all months. *H. oligactis,* found in East Hollow in October 1988 and in January, August and October 1989 is the most spectacular of the three, with very much longer, even thread-like, tentacles which coil and intertwine. Le Gros (1969) observed that *H. viridissima* was 'usually plentiful under the leaves of duckweed, but its numbers fall sharply towards the end of the year'. In the mild winter of 1988-89, dense patches of duckweed continued in Lower Eastern Pond and on 11 December *H. viridissima* was still active and budding.

Rotifera

The ponds at Bookham are no exception to the general rule that in many fresh waters the rotifers are the star performers. Rotifers are highly organised multi-cellular animals which range in size from ½0 mm to 1 mm and often are smaller than some protozoons. Mostly they live in fresh water; not only in ponds and lakes, but in puddles, flooded cart-tracks, roof gutters, even moss (Anon. 1985). A litre of water from a farm pond may contain a quarter of a million of them. Reproduction is mainly parthenogenetic, but in some groups haploid eggs arise which, when fertilised, are able to withstand the freezing or drying of the habitat and give rise to a new generation after perhaps several years (E. D. Hollowday *in litt.*).

Free-swimming monogonontid rotifers were present in many of the 40 samples, and on 23 October, 1988 rotifers of various species were particularly well represented in samples from Eastern Hollow. The assistance of Mr E. D. Hollowday in confirming the identity of the plankton rotifers *Keratella cochlearis* and the much larger *Brachionus calyciflorus* in those samples is gratefully acknowledged. One of the more distinctive and easily recognisable species is the fast and very active *Filinia longiseta.* On 8 October 1989, but not on other dates, this and other rotifers in Eastern Hollow were hosts to large numbers of epizoic unicellular green algae, which were clustered so thickly as to cover some of the rotifers almost completely.

The sessile rotifers *Stephanoceros fimbriata, Floscularia ringens* and *Collotheca ornata* have been much prized since the earliest days of microscopy as objects for microscopical examination in life, and all three are to be found in small numbers at Bookham. *Stephanoceros fimbriata* was first recorded for the survey by John Coles in a sample from Eastern Hollow on 23 October 1988 (*Lond. Nat.* **68:** 136). On a floating fragment of *Myriophyllum* taken from the same pond on 8 January 1989, six more examples of this striking organism were discovered. *Floscularia ringens* (formerly *Melicerta ringens*) is a sessile rotifer which dwells in a tube self-constructed from particles; from which it extends to feed and into which it smartly retracts when struck by hurrying neighbours. The technique known as dark-ground illumination is especially suitable for viewing this species, and when thus seen *F. ringens* becomes an object of jewel-like beauty. It was found attached to a strand of *Myriophyllum* in East Hollow on 8 October 1989. *Collotheca ornata* is perhaps the most easy of the three to overlook as it is colourless and lives in a transparent jelly-like sheath. If undisturbed, long filaments stream out with a rapid motion from the sheath, followed by the rest of the organism; a performance reminiscent of the opening of a flower as seen by time-lapse cinematography. *C. ornata* was found on floating *Myriophyllum* in Eastern Hollow on 8 October and 11 December 1989, and on *Lemna minor* on 12 March 1989.

Experienced limnologists will have had no need of the descriptive comments embodied in the foregoing, but if these notes should encourage limnologists of all degrees of experience to join us at Bookham, and add to our collective knowledge whilst reinforcing their own, the enthusiasm for the subject which

has caused me to stray from the narrow path of a strictly systematic account will perhaps have been infectious to some good purpose.

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Neuroptera (Geoffrey Beven)

Dr Ian Menzies reports that an adult hook-tip lacewing-fly *Drepanepteryx phalaenoides* (Linnaeus) was beaten from holly growing under old oaks by Common Road, Hill House Wood on 11 March 1989. This is a very scarce species, hardly known in the south of England. A list of 13 other species of lacewings already recorded here by A. E. Le Gros is given in *Lond. Nat.* **46:** 111 (1967).

Lepidoptera (Geoffrey Beven)

An adult male marbled white butterfly *Melanargia galathea* was caught by Ian Menzies in a grassy area of Bayfield Plain North on 22 July 1989. This has been seen once before, on 20 July 1985, also on Bayfield Plain, by D. A. Boyd. A white-letter hairstreak *Strymonidia w-album* was seen on elm 883 on 23 July 1989 (I.F.S.).

Coleoptera: Species New to Bookham Common (Ian Menzies*)

Unless stated otherwise, the records and observations given below were made by the author.

RD = Red Data Book classification by the Nature Conservancy Council.

BUPRESTIDAE

Agrilus sinuatus (Olivier) — *RD2.* Single specimens beaten from old hawthorns in the Isle of Wight area; 20 July 1984 by Hill House Path; 28 July 1984 by Hollow Path.

Agrilus viridis (Linnaeus) — *RD2.* Colony found in a fallen sallow, Sheepbell Wood; 12 June 1988 four adults beaten from sallow foliage. The beetles were subsequently seen, up to six at a time, actively flying around and at rest on the foliage of this sallow in the afternoon sun, between 3.0 and 4.0pm, on 13, 15, 22 and 24 June 1988. Exit holes were present in one of the main trunks, which was partly dead. Unfortunately the sallow, which was immediately alongside the Sheepbell car park, was removed during the winter of 1988-89.

*Villiers Lodge, 1 Cranes Park, Surbiton, Surrey KT5 8AB.

CANTHARIDAE

Podabrus alpinus (Paykull). One adult beaten from aspen, 6 July 1986, Eastern Plain.

Rhagonycha testacea (Linnaeus). Found in some numbers by sweeping low vegetation by Bookham Stream, Bayfield Plain North: 27 May 1989 (10); 1 July 1989 (2).

COCCINELLIDAE

Halyzia 16-guttata (Linnaeus). Two examples swept from grassy area, Bayfield Plain North, 30 October 1989.

Thea 22-punctata (Linnaeus). Well established on Central, Bayfield and Isle of Wight Plains in the 1980s: 27 August 1988 (2); 17 May (3) and 1 July 1989 (2), by sweeping grassy areas.

TENEBRIONIDAE

Prionychus ater (Fabricius). One adult found under a rotten oak log, Hill House Wood East, 30 June 1953.

PYROCHROIDAE

Pyrochroa coccinea (Linnaeus). One adult found at rest on sallow foliage, Isle of Wight Plain, 6 May 1989.

MORDELLIDAE

Tomoxia biguttata (Gyllenhal) — *RD3*. One adult beaten from oak, Central Wood West, 30 June 1953.

CERAMBYCIDAE

Strangalia quadrifasciata (Linnaeus). One adult at rest on aspen leaf, Eastern Plain, 25 August 1979.

Phytoecia cylindrica (Marsham). Several adults found by sweeping lush vegetation by Bookham Stream, Bayfield Plain North, 17 May (1) and 27 May 1989 (2).

CHRYSOMELIDAE

Zeugophora flavicollis (Marsham) — *RD1*. Adults occasionally beaten from mature aspen on Eastern Plain, 24 June 1951 (1-I.S.M.), 22 Sept. 1988 (1-J. A. Owen), and then 25 September 1988 (2) and 18 September 1989 (1), both records by I.S.M.

Cryptocephalus parvulus (Muller). Frequent on sapling birch on Eastern Plain during the 1950s (I.S.M.'s observations) 24 June 1951 (1), 6 June 1953 (1), 29 June 1953 (1), 1 June 1955 (3). Not seen in recent years.

Timarcha goettingensis (Linnaeus). One adult found in grass clump, Central Plain, 6 May 1989.

Chrysolina brunsvicensis (Gravenhorst). Though not previously recorded this species is now well established, associated with *Hypericum* mainly *tetrapterum* (*H. quadrangulum*) on the Central and Western Plains, and by the ponds. 18 September 1988 (1), 2 October 1988 (2), 20 October 1988 (4 in company with *Chrysolina hyperici* Fors. on *Hypericum perforatum*), 3(1) and 5 May 1989 (1), also 1 October (6), 12 October (6) and 14 October 1989 (3).

Galeruca tanaceti (Linnaeus). Though not previously recorded, this species is now well established on Bayfield, Western, Isle of Wight and Central Plains. 27 August (1) and 18 September 1988 (2), 1 October, 12 October (3) and 30 October 1989 (1), mainly by sweeping grassy areas by the sides of paths.

Aphthona euphorbia (Schrank). Six adults beaten from holly growing under oaks by Common Road, Hill House Wood, 11 March 1989.

Chalcoides nitidula (Linnaeus). Though plentiful on mature aspens, Eastern Plain, during the 1950s (I.S.M.'s observations), this species is now very scarce. 11 June 1952 (1), 6 June 1953 (1), 11 July 1954 (6), 25 September 1988 (1), 24 September 1989 (2).

Epitrix pubescens (Koch). Locally abundant on woody nightshade *Solanum dulcamara*, Western Plain, 10 September 1988 (3), 14 June 1989 (6).

Psylliodes picina (Marsham). One adult by sweeping, Western Plain 24 August 1989.

ATTELABIDAE

Apoderus coryli (Linnaeus). Though not previously recorded, this species is now well established and frequent on hazel in Central, Eastern and Sheepbell Woods, *e.g.* 6 July 1986 on hazel leaf.

Byctiscus betulae (Linnaeus) On aspen, Eastern Plain, 3 June (1) and 12 June (1) 1988.

PLATYPODIDAE

Platypus cylindrus (Fabricius) — *RD3.* One adult found on oak log, Central Wood south, 10 September 1988 (I.S.M. and J. A. Owen). Borings have subsequently been seen in several oak logs, August-September 1989.

Odonata (Ruth Day*)

The long, hot summer of 1989, with plenty of sunshine, provided a very good year to watch dragonflies. I carried out my usual damselfly mark/recapture study at the end of July, but also made two previous visits to Bookham on 27 May and 11 June.

On 27 May *Libellula depressa* was mating at Sheepbell Pond, and I also saw males at South-East Pond and Eastern Hollow and a female at Lower Eastern Pond. On the same day, I saw three male and one female *Pyrrhosoma nymphula* at Sheepbell Pond and four males at Lower Eastern Pond, where I had not previously seen this species. There were also a few *Ischnura elegans* and *Coenagrion puella* about.

On 11 June I noted that *Coenagrion puella* were 'abundant' at Lower Eastern Pond, though the duckweed had not reappeared. This is interesting, as they certainly were not at the end of July when I came back to count them, and I had supposed in 1988 that the absence of duckweed *Lemna minor* implied the presence of enough fish to have eaten most of the larvae (Day 1989). During the winter, Ian Swinney had raked out Sheepbell Pond, getting rid of a great deal of rotting vegetation, which had been deoxygenating the water to an increasing extent. I made four random dips with a net in this pond and it is interesting to compare the result with a similar four random dips in 1985. This comparison is shown in Table 1. Not only were there far more animals in the pond this year, but the presence of *Baetis,* the most common species of mayfly larva, shows that the water had more oxygen.

At the end of July I saw *Sympetrum sanguineum* and *Aeshna cyanea* on most days at both South-East and Lower Eastern Ponds. *Aeshna grandis* was also present at Lower Eastern Pond. As Table 3 shows, this period in 1989 was both warmer and had brighter sunlight than its equivalent in 1988. Conventional wisdom would suggest that there should therefore have been more damselflies, but there were not (Tables 2 and 3). The population of male *Lestes sponsa* was comparable to previous years (Day 1989); there were only a few *Coenagrion puella* at Lower Eastern Pond and an average number at South-East Pond. I suspect that the long period of warm sunny weather from May onwards had produced an earlier emergence of most of the *C. puella* and that by the time I came to count them they had more or less shot their bolt. *L. sponsa* is less likely to emerge early, as this species does not hatch from the egg until spring (Corbet 1956), but even they showed unusual behaviour. In previous years, I had always found a number of females sitting on the reeds at Lower Eastern Pond. There were usually about 10% of the number of males. In the beautiful weather of 1989, I found none — only males.

*18 Zenoria Street, London SE22 8HP.

TABLE 1. Comparison between the pond animals caught with four random sweeps of a net in Sheepbell Pond, before and after the bottom was raked out.

Taxon	Before raking 1 September 1985	After raking 11 June 1989
MOLLUSCA		
Planorbis complanatus	1	—
CRUSTACEA		
Cyclops sp.	2	7
Gammarus pulex	3	21
INSECTA		
Corixa sp.	1	20
Aeshna cyanea	2	—
Dytiscus sp.	1	2
Baetis sp.	—	7
Chironomidae sp.	—	10
Asellus aquaticus	—	13
VERTEBRATA		
Newt larvae	—	5
Fish fry	—	4

TABLE 2. Estimates of three populations of male damselfly on 27 July 1989 using Jolly's stochastic method, compared with the means of similar estimates for previous years.

	Coenagrion puella at Lower Eastern Pond	*Coenagrion puella* at South-East Pond	*Lestes sponsa* at Lower Eastern Pond
1989	57	205	382
1988	Too rare for this method	153	235
1987	248	397	187
1986	419	Not surveyed	279
1985	175	225	Too rare for this method

TABLE 3. Temperature, light and numbers of male damselflies caught on each day of fieldwork in 1988 and 1989.

Note: *Cp* stands for *Coenagrion puella*, *Ls* for *Lestes sponsa* and D. et for damselflies caught.

South-East Pond

	1988						1989				
Date July		Air temp °C	Light 1,000 lux	Time B.S.T.	D. et *Cp*	Date July		Air temp °C	Light 1,000 lux	Time B.S.T.	D. et *Cp*
						M	24	30	6	14.40	3
						Tu	25	29	13	14.50	9
Tu	26	20	27	12.44	34						
W	27	19	19	14.21	30	Th	27	23	108	11.00	40
Th	28	16	2	14.30	12	F	28	23	54	11.20	25
F	29	19	13	12.17	43	S	29	24	108	12.30	27
S	30	17	2	15.20	29						

Lower Eastern Pond

	1988						1989					
Date July		Air temp °C	Light 1,000 lux	Time B.S.T.	D. et *Cp*	*Ls*	Date July		Air temp °C	Light 1,000 lux	Time B.S.T.	D. et *Cp*	*Ls*
							M	24	30	27	13.05	12	40
							Tu	25	29	27	13.25	14	45
Tu	26	20	27	14.15	3	30							
W	27	19	19	12.21	17	39	Th	27	26	108	13.20	8	40
Th	28	16	2	12.30	4	36	F	28	27	54	13.10	13	40
F	29	19	13	14.37	3	33	S	29	26	108	14.30	7	40

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Amphibians (Geoffrey Beven)

A male great-crested newt *Triturus cristatus* was found by Ruth Day in South-East Pond on 25 April 1987, when also six adult and one larval smooth newt *T. vulgaris* were found in the same pond. There seem to be no previous records of great-crested newts in South-East Pond although they do occur in the Isle of Wight chain of ponds. A smooth newt was found by Nigel Davies hibernating in the dam of South-East Pond on 27 September 1978.

On 17 February 1989 five toads *Bufo bufo* were noted along Common Road 82 and 86, and on 18 February one was found sheltering in a hardcore heap at Mark Oak 385 (I.F.S.). There was toad spawn in Eastern Hollow and Lower Eastern Ponds on 12 March (K.G., E.W.G.). Toads do not usually reach the ponds until mid-March or later, but the winter was mild. On 12 March there was much frog spawn in Crater Pond 466 and some in South-East Pond (K.G., E.W.G., I.F.S.).

Reptiles (Geoffrey Beven)

Three grass snakes *Natrix natrix* were found entwined in Sheepbell Wood 375 on 13 March. They were probably mating, which may occur from the end of March to June (Frazer 1983) (A.N.P.).

Reference

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Birds (Geoffrey Beven)

Population Studies

Andrew Merritt and Ron Kettle made nine visits between February and June 1989 to the 16-hectares of dense pedunculate oakwood (Eastern Wood). In 1984, 1987, 1988 and 1989 the wren *Troglodytes troglodytes* territories were 27, 21, 24 and 32, the blackbird *Turdus merula* 12, 10, 12 and 17, and the robin *Erithacus rubecula* 26, 29, 31 and 38. The number of great tits *Parus major* for the same years was 13, 19, 12 and 15, and the number of blue tits *P. coeruleus* was 23, 23, 25 and 27. Thus all five species show some increase although this may be due partly to an increase in the number of visits (nine compared with six in 1988).

No census ws made in the 39-hectares of scrub and grassland during 1989.

Birds in 1989

Two grey herons *Ardea cinerea* were circling over Central Wood 533 on 18 February, and on 13 March there were three heron nests in Stents Wood West 285, five nests in Central Wood 533 and one nest in Eastern Wood 615. Three or four of these were occupied, one in Eastern Wood, producing at least one young, two nests were occupied in Central Wood and one, possibly occupied, in Stents Wood. The overall success is not known, but on 19 and 20 June two young birds landed in fields near Handley's Cottage, too weak to move, and were caught by Alan Snow and fed on whitebait (one pound a day) and carp from the fishermen. On 25 June both birds were released beside the Hollow Ponds (N.C., A.M., A.N.P., I.F.S.).

At sunset on 8 October three male and three female mandarin ducks *Aix*

galericulata were on Eastern Hollow Pond and did not fly, but hid behind branches of oaks and other trees which reached down to the level of the water (C.B.A.). A young water rail *Rallus aquaticus* with healthy plumage and no obvious injury, was found dead on 24 November at the edge of Lower Eastern Pond 596 (I.F.S.).

Four or five nightingales *Luscinia megarhynchos* were heard singing in May in squares 46, 48, 49, 76, 81 and 85 (A.M., I.F.S.).

Sylviinae: Old World Warblers

Carrington *et al.* (1944) described the chiffchaff *Phylloscopus collybita* as a moderately common summer visitor, restricted to the woods. When a census was made in an area of grassland and scrub with scattered trees — Western, Isle of Wight and Bayfield Plains 24 ha (61 acres) by W. D. Melluish (1960) — chiffchaffs were not considered to breed there, but 4 were seen in 1954, one in 1957, and three in 1959. However, the scrub and trees were getting larger, and in 1964 Central Plain was included in the area, now covering 39 ha (96 acres) when the number of territories of singing males was in 1964 1, '65 2, '66 4, '67 3, '68 3, '69 4, '70 5, '71 3, '72 7, '73 5, '74 4, '75 4, '76 4, '77 7, '78 6, '79 5, '80 7, '81 5, '82 4, '83 6, '84 3, '85 6 (G.B., D.A.B., W.D.M.). With such a small population one would hesitate to attach significance to small changes but there was an increase in numbers in 1977, 1978, 1980 and 1985. The figures for Britain as a whole (B.T.O. Common Bird Census) also showed an increase in farmland in 1977, 1978, 1980 and 1985 (Marchant 1978, Marchant and Hyde 1980, Marchant and Taylor 1981, Marchant and Whittington 1986, 1989, Simms 1985).

In Eastern Wood, a pedunculate oakwood of 16 ha (40 acres), in 1949 there was one chiffchaff territory, '50 2.5, '51 4.5, '52 2.5, '53 2, '54 5.5, '55 4.5, '56 4.5, '57 NC, '58 1.5, '59 2, '69 3, '61 1, '62 1.5, '63 2, '64 5, '65 7, '66 6, '67 6, '68 3, '69 3, '70 4, '71 1, '72 1, '73 4, '74 4, '75 1, '76 4, '77 3, '78 5, '79 4, '80 3, '81 4, '82 6, '83 4, '84 7, '85 NC, '86 NC, '87 6, '88 6, '89 5 (NC = no count) (G.B., L.M. A.M.). Thus in Eastern Wood the numbers increased in 1954, 1965, 1966, 1967, 1982, 1984, 1987 and 1988. In woodland Britain as a whole (B.T.O. Common Bird Census) chiffchaffs increased from 1964 to 1970, decreased in 1971 and subsequently, but increased again in 1980, 1985, 1987 and 1988 (Marchant and Whittington 1988, 1989, Simms 1985). Thus the larger populations at Bookham were often associated with more widespread changes in Britain.

Willow warblers *Phylloscopus trochilus* were described as 'abundant and distributed widely over woodland and scrub' (Carrington *et al.* 1944). P. W. E. Currie (1950) noticed that the grass of the greater part of the plains was deliberately burnt in March 1948 'to improve the grazing', so he then studied the willow warbler population of Western, Isle of Wight and Bayfield Plains 24 ha (61 acres). He found ten territories in 1948, but in 1949, when there was no burning of the grass, there were 21.

W. D. Melluish studied the willow warblers on Western, Isle of Wight, and Bayfield Plains 24 ha (61 acres) and found 7 territories in 1954, '55 7, '56 8, '57 16, '58 11, '59 13, '62 12, '63 8 (Melluish 1960, 1969). Central Plain was then included in the census area, making the total 39 ha (96 acres). The number of territories were: '64 20, '65 14, '66 19, '67 27, '68 21, '69 26, '70 14, '71 18, '72 22, '73 20, '74 21, '75 24, '76 37, '77 28, '78 24, '79 22, '80 16, '81 21, '82 22, '83 13, '84 25, '85 26 (G.B., D.A.B., W.D.M.). In March 1965 there was a fire on 8 ha (20 acres) on Central Plain, which burnt off all the grass and charred a great many shrubs. In this area in 1965 there were no willow warbler territories where there had been six in 1964. There were no further fires and the population on the plains increased, particularly in 1967, 1968 and 1969. Nationally, the populations in farmland in the country as a whole, rose steadily from 1967 to

1970 (Batten 1971 *a,b*). In 1976 there was a long, hot, dry summer and the number of willow warbler territories on Bookham Common was very high, in 1976 37, and in 1977 28, while the population in the farmland in Britain generally increased in 1976, 1977, 1980 and 1981 (Batten and Marchant 1977, Marchant 1978, Simms 1985).

In Eastern Wood, 16 ha (40 acres) of pedunculate oakwood, a census was started in 1949 when there were 16.5 territories, in '50 21, '51 16, '52 15, '53 15, '54 11, '55 8.5, '56 17.5, '57 NC, '58 12, '59 5, '60 2.5, '61 2, '62 1.5, '63 2.5, '64 1.5, '65 4, '66 4, '67 2, '68 6, '69 2, '70 2, '71 0, '72 0, '73 0, '74 0, '75 2, '76 1, '77 1, '78 1, '79 2, '80 0, '81 0, '82 2, '83 1, '84 1, '85 NC, '86 NC, '87 1, '88 0, '89 2 (NC = no count) (G.B., L.M., A.M.). Thus, in 1949 until about 1960 the wood was more open and the footpaths quite wide and the willow warbler was quite common, but when the wood became more dense and the trees increased in size and numbers at the edge of the paths, which thus became narrower, the willow warblers decreased markedly. By the end of the 1960s the territories varied from 0 to 2 (Beven 1976).

The records of wood warbler *Phylloscopus sibilatrix* were given in *Lond. Nat.* **63:** 130 (1984). They nested near Sheepbell Farm 329 in 1968 and possibly also in 1971. There have been no other definite records of breeding, but they have been quite often heard singing in spring, presumably chiefly on passage.

In 1978 a male Cetti's warbler *Cettia cetti* occurred along Bookham Stream from 13 May until 5 July (G.B., A.M.). One was heard singing on Western Plain on 12 July 1981 (E.M.H.).

Grasshopper warblers *Locustella naevia* seem to have nested in most years and 'as many' as 20 were seen in 1934 (H.J.B.), but it appears now to be an erratic and decreasing visitor. In the years up to 1942, at least one pair nested (Carrington *et al.* 1944), and two were present in 1946 (A.R.W.). P. W. E. Currie (1950) found three territories in 1948 and five in 1949 on Western, Isle of Wight and Bayfield Plains 24 ha (61 acres), and in the same area W. D. Melluish found one territory in 1962 and three in 1963. In 1964 the census area also included Central Plain, making a total of 39 ha (96 acres) and the number of territories was as follows: '64 3, '65 2, '66 6, '67 3, '68 5, '69 6, '70 5, '71 5, '72 4, '73 4, '74 3, '75 2, '76 2, '77 0, '78 0, '79 0, '80 0, '81 0, '82 0, '83 0, '84 0, '85 2 (G.B., D.A.B., W.D.M.). Elsewhere in England there have been peaks of population in 1966 and 1968-71 (Montier 1977) and a decrease of population since 1977 in other parts of the country. At Bookham none was found in 1977, but after an absence of eight years grasshopper warblers returned in 1985 when there were two singing males. Unfortunately there have been no counts since. In parts of Surrey, where there was also a peak of population from 1968-73, the numbers decreased in 1977-8 (*Surrey Bird Reports* 1962-1987). It has also been shown that at nine coastal British bird observatories they were much more numerous in the spring and autumn from 1966 to 1970 than in the period 1973 to 1979, with a marked decline in 1973 and subsequently (Riddiford 1983). The numbers of grasshopper warblers fluctuate markedly from year to year, due in part to local habitat changes. Areas of dense vegetation cleared in one year may be ideal for grasshopper warblers again two or three years later (Sharrock 1976). However, the main cause of this variation in numbers seems to be unknown.

A reed warbler *Acrocephalus scirpaceus* was observed by D. A. White along Bookham Stream 498 on 8 May 1955.

Sedge warblers *Acrocephalus schoenobaenus* have been observed nine times since 1949, usually in April-early May along Bookham Stream, the Isle of Wight Pond, Lower Eastern Pond and Central Ditch, but once on 23 July 1949 (G.B., S.H.C., E.M.F., W.D.M., F.C.R.).

The garden warbler *Sylvia borin* was 'never a common species' (Carrington *et al.* 1944), but from 1949 it was found regularly breeding in Eastern Wood,

16 ha (40 acres) of pedunculate oakwood. The number of territories were: '49 3, '50 3, '51 3, '52 3, '53 4, '54 2, '55 4, '56 4, '57 NC, '58 7, '59 3, '60 3, '61 2, '62 4, '63 2, '64 2, '65 4, '66 1, '67 1, '68 1, '69 1, '70 1, '71 0, '72 0, '73 0, '74 1, '75 1, '76 2, '77 2, '78 0, '79 1, '80 1, '81 2, '82 1, '83 2, '84 2, '85 NC, '86 NC, '87 0, '88 0, '89 0 (NC = no count) (G.B., L.M., A.M.). The population in oakwood has decreased since about 1966, due possibly to increased density of trees in Eastern Wood.

On Western, Isle of Wight and Bayfield Plains 24 ha (61 acres) the garden warbler was regarded as a non-breeding bird in the early years of the survey, although in 1954 two birds were seen, '55 4, '56 4, '57 3, and in '59 5 (Melluish 1960), but in 1962 there were two singing males (W.D.M.) and the shrubs on the plains were clearly increasing. From 1964 Central Plain was added to the census area making a total of 39 ha (96 acres) on which the number of territories were: '64 4, '65 1, '66 0, '67 1, '68 2, '69 2, '70 3, '71 5, '72 5, '73 4, '74 5, '75 3, '76 8, '77 6, '78 12, '79 8, '80 7, '81 4, '82 6, '83 7, '84 6, '85 6 (D.A.B., W.D.M.). Previously it was suggested that the increase of garden warblers on the plains from about 1970 was due probably to an increase in the size and number of shrubs (Beven 1974). Between 1973 and 1985 there has been a further population increase, sometimes rising to 8-12 territories in 39 ha (96 acres), no doubt associated with the steady increase in the size of shrubs and trees.

The blackcap *Sylvia atricapilla* was a common bird in 1943 (Carrington *et al.* 1944) and a census in the oakwood Eastern Wood 16 ha (40 acres) was started in 1949, when there were three singing males, in '50 3, '51 4, '52 3, '53 2, '54 3, '55 2, '56 3, '57 NC, '58 3, '59 4, '60 2, '61 4, '62 3, '63 5, '64 3, '65 4, '66 7, '67 6, '68 3, '69 6, '70 1, '71 3, '72 4, '73 3, '74 2, '75 2, '76 4, '77 5, '78 4, '79 4, '80 2, '81 5, '82 4, '83 5, '84 7, '85 NC, '86 NC, '87 6, '88 6, '89 7 (NC = no count) (G.B., L.M., A.M.).

One blackcap was recorded on Western, Isle of Wight and Bayfield Plains 24 ha (61 acres) in 1956, '57 3, '58 2, '59 2, but it was not then considered as breeding (Melluish 1960). In 1963 however, there was one singing male (Melluish 1969) and from 1964 Central Plain was included in the census making the total area 39 ha (96 acres). The number of territories of singing males was: '64 1, '65 2, '66 1, '67 2, '68 2, '69 2, '70 3, '71 4, '72 7, '73 7, '74 5, '75 5, '76 4, '77 4, '78 8, '79 3, '80 2, '81 3, '82 4, '83 4, '84 2, '85 6 (D.A.B., W.D.M.). The increase in population in recent years is, no doubt, partly associated with the increase in size and numbers of the trees and shrubs. In Britain generally, however, blackcaps showed marked increases in the decade up to 1973 and they increased again in farmland in 1982 (Batten and Marchant 1975, 1976, Marchant 1983, Simms 1985).

In spring blackcaps are largely insectivorous, but on 12-13 April a male was seen eating ivy *Hedera helix* berries (P.W.E.C.). In late summer and autumn they may be seen swallowing red berries of woody nightshade *Solanum dulcamara*, perhaps four berries taken in quick succession, and elder *Sambucus nigra* berries, even pecking at them when they are still green. At this season they may also swallow hawthorn *Crataegus* berries (G.B.). This was not observed by Witherby *et al.* (1938) or by Snow and Snow (1988) but is recorded by Leach (1981).

The whitethroat *Sylvia communis* is 'well distributed over the plains ...' (Carrington *et al.* 1944) and P. W. E. Currie (1950) wrote 'is very generally distributed over the plains wherever there is suitable cover, but it is not found in the open grassy areas where there is no scrub or tree'. Currie studied this species in an area including Western, Isle of Wight and Bayfield Plains 24 ha (61 acres). In March 1948 the grass on these plains was deliberately burnt in order 'to improve the grazing'. Some scrub was also burnt as a result of burning the dead bracken. His figures were 1948 14 territories and in 1949 27, the

number of nesting pairs had been reduced in 1948, but had recovered well in 1949. W. D. Melluish (1960, 1969) studied the whitethroat territories in the same area 24 ha (61 acres) and found in 1954 8 territories, '55 7, '56 9, '57 8.5, '58 8.5, '59 12, '62 12, '63 8. In 1964 the census included Central Plain making a total area of 39 ha (96 acres), the number of territories being: '64 12, '65 17, '66 17, '67 22, '68 16, '69 11, '70 14, '71 12, '72 13, '73 17, '74 13, '75 7, '76 16, '77 8, '78 9, '79 9, '80 8, '81 11, '82 14, '83 11, '84 12, '85 14 (D.A.B., L. M., W.D.M.).

On 31 March 1965 the grass on eight hectares (20 acres) of Central Plain was blackened by fire and a great many shrubs were charred. Although in that year the willow warblers were reduced in numbers to nil in these eight hectares, where there had been six territories in 1964, the whitethroat numbers had actually increased. Perhaps by the time the whitethroats had settled down to nest the rank herbage (other than grass) had grown up sufficiently, possibly being below ground at the time of the fire. Whitethroats build their nests in rank herbage and low bushes and feed mainly at this level. The whitethroats were present in large numbers in 1967 (22) but they fell to eight in 1977 and remained at a low level until partial recovery from 1981-1985. A general population decrease occurred in Britain as a whole from 1969 onwards (Common Bird Census). This decrease is considered to be due to a decrease of rain in the Sahel zone, at the southern edge of the Sahara (Winstanley *et al.* 1974). It is interesting that the population at Bookham has improved since 1981, and some increase was noticed generally in Britain in 1982 (Marchant 1983).

In Eastern Wood 16 ha (40 acres) of pedunculate oakwood, which was studied from 1949 onwards, the wood was more open and the footpaths quite wide in the early years of the survey. During this period there was in 1949 one territory, '50 2, '51 1, '52 2, '53 2, '54 2, '55 0, '56 1, '57 NC, '58 1, '59 1, '60 1, '61 1, '62 1, '63 1, '64 1, '65 0, '66 1, '67 0, '68 1, '69 0, '70 0. By then the wood had become more dense and had spread onto and narrowed the paths and from 1969 until 1989 there were no whitethroat territories (NC = no count) (G.B., L.M., A.M.).

Whitethroats are mainly insectivorous, but in August have been seen eating berries of woody nightshade and elder berries, most of the latter not ripe (G.B., P.W.E.C.).

The lesser whitethroat *Sylvia curruca* is found mainly in shrubbery and at the edges of woods. W. D. Melluish (1969) counted the number of territories of singing males on Bayfield, Isle of Wight and Western Plains in 1962 when there was none and in 1963 two. In 1964 Central Plain was also included in the census, making a total area of 39 ha (96 acres) and the number of territories was '64 0, '65 4, '66 3, '67 1, '68 1, '69 2, '70 3, '71 4, '72 4, '73 5, '74 3, '75 4, '76 5, '77 4, '78 6, '79 3, '80 3, '81 3, '82 3, '83 1, '84 2, '85 3 (D.A.B., L.M., W.D.M. (Melluish 1969)). The numbers of lesser whitethroats in Britain generally, increased in 1966 and then decreased from 1967-1970, increased again in 1973-1978, then decreased again from 1979-1982 (B.T.O. Common Bird Census, Simms 1985).

In pedunculate oakwood Eastern Wood 16 ha (40 acres) there were no lesser whitethroat territories in 1949, one in 1950, and one in 1951, but none since (G.B., L.M., A.M.). As mentioned under *Sylvia communis*, in the early years of the Survey the wood was more open and the footpaths quite wide, but it gradually became more dense and the footpaths were narrowed by the growth of young trees.

Although mainly insectivorous, lesser whitethroats may be seen in September eating blackberries *Rubus fruticosus*, by picking out each drupelet and swallowing it whole (G.B.).

Fringillidae

A further note to Beven (1989) on woodland chaffinches *Fringilla coelebs* is given below. The numbers of singing males in Eastern Wood, a pedunculate oakwood of 16 ha (40 acres), from 1946 to 1989, were as follows: '46 6, '47 –, '48 –, '49 9.5, '50 11, '51 12.5, '52 9.5, '53 9, '54 8, '55 8, '56 6, '57 –, '58 4.5, '59 2, '60 2.5, '61 4.5, '62 7, '63 5.5, '64 7, '65 8, '66 7, '67 6, '68 4, '69 4, '70 3, '71 6, '72 8, '73 3, '74 1, '75 3, '76 3, '77 3, '78 3, '79 2, '80 3, '81 4, '82 2, '83 3, '84 4, '85 –, '86 –, '87 4, '88 4, '89 8 (G.B., R.K., L.M., A.M.). There were no counts in 1947, '48, '57, '85 and '86. The population was high (8-12.5) from 1949-55, and has not exceeded eight since, although it has waxed and waned three times with peaks to eight in 1965, 1972 and 1989. This may be because, since the 1950s The National Trust stopped felling occasional large trees in Eastern Wood (so as not to disturb the bird census there) and the wood gradually became more dense, with growth of young trees causing narrowing of the footpaths. Some felling of occasional trees was resumed in 1975, but E. M. Nicholson tells me that in 1932 he considered that chaffinches were more numerous than now. In 1932 the estimated bird populations in Great Britain showed that the numbers of chaffinches ranked first, with the blackbird *Turdus merula* second (Nicholson 1988). Between 1932 and 1970 the wren *Troglodytes troglodytes* became first, followed by the blackbird, while the chaffinch decreased to ninth (Sharrock 1976). In the five years 1949-53 in Eastern Wood, Bookham Common, the chaffinch averaged 10.3 pairs while the blackbird averaged 8.6, whereas, in subsequent years the chaffinch five-year average did not exceed six, while the blackbird increased its numbers to 16.4 in 1980-84. 'In Britain the population of chaffinches may have reached a peak in about 1950 and then declined. Few figures are available for this period before the Common Bird Census was started, but Beven (1963) working in Surrey oak woodland reported minimum numbers in 1959 and a subsequent increase. From 1962, the first year for which there is a CBC farmland index, the chaffinch population increased steadily for three years, then stabilised ...' (Sharrock 1976).

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Mammals (Geoffrey Beven)

General

A badger *Meles meles* was seen running into Station Copse from Central Plain 885 at 11.30a.m. on 24 June (I.F.S.). During the year there were 12 records of single roe deer *Capreolus capreolus*, two were seen five times, three together were seen three times and four together were seen once (C.B.A., N.C., A.M., A.P., I.F.S.). The roe deer remains common although I. F. Swinney was too busy to record them all, especially in the second half of the year.

Grey Squirrels: Some of the Food Taken in Oakwood

Grey squirrels *Sciurus carolinensis* are very numerous in some years, as in 1961, and in 1972 when on 8 October as many as 17 were seen in Eastern Wood. Every year or so a 'shoot' takes place, now carried out by a National Trust team, as part of control measures. The numbers of squirrels shot varies from 30 to 200 or more. Eighty were shot on 13 March 1989.

In the oakwood in February-March squirrels bite off hazel catkins and sprays of male sallow catkins: many remain uneaten so that the ground below is yellow. Similarly they pull off many white flowers of wild cherry in April-May, and in July leaves may also be eaten. In May the pedunculate and Turkey oak catkins and young leaves, and from August onwards their acorns, hazel nuts and crab apples are consumed. Fungi are sometimes an important addition to the diet and may be found in 13-20% of stomach contents (Moller 1983). At Bookham the following fungi (identified by P. C. Holland) have been found partially eaten and with the tooth-marks of squirrels — *Russula xerampelina*, *R. cyanoxantha*, *R. emetica*, *Amanita fulva*, *Tricholoma fulvum* and *Boletus* sp.

Cherry galls *Cynips quercusfolii* found on fallen oak leaves in November 1963 had been bitten open by squirrels and the gall-wasp was gone, the bitten piece lying on the leaf near the rest of the gall. Two untouched cherry galls were opened by me and each contained an adult winged black gall-wasp quite ready to emerge and they walked off briskly! In September 1970 many cherry galls were lying on the ground, most had been opened by squirrels (the tooth marks being seen) and the wasps absent from the central chambers. In August some soft green marble galls *Andricus kollari* were found on the ground and had been opened by squirrels. A. E. Le Gros was sitting under an oak tree in May when he was showered by fragments of oak-apple *Biorhiza pallida* from a squirrel in the tree above. 'There were many cells containing larvae in the fragments and many of these larvae would survive!' Concentrated feeding on insects for short periods has been described, but the total quantity seems to be small 2-3.5% (Moller 1983).

Squirrels may be seen stripping bark in May-June, tooth-marks are visible in the stripped bark. From the birches the silver bark was removed and also the fresh green bark underneath. Shorten (1954) believes that the squirrels do this to lick or chew the cambium layer in order to obtain the sweet sap, which is ascending in May-June. Kenward (1983) suggests that the sweet sap is taken as a subsidiary food during food shortage in late spring and perhaps squirrels also have a liking for sweet sap. Bark stripping was very marked in 1961, when in Eastern Wood 42 silver birches, one downy birch and one hazel were attacked. In 1967 in Eastern Wood six silver birches, one pedunculate oak and one beech showed stripping, but in 1975 only one or two silver birches were seen to be affected. The trunk or branch was often completely ringed, and the bark

stripped from birch trunks three to twelve metres (10 to 40 feet) up and from branches above eight metres (25ft) up. Oaks were stripped from twelve metres (40ft) and beech from 17 metres (50ft) up. Pieces of bark were often lying at the foot of the tree, birch bark nine inches long, and oak five inches. Where the trunk or branch had been ringed, often the lowest part of the stripping, a break occurred, especially if there was the extra weight of snow. After extensive stripping death of the whole tree may occur; one birch ringed in 1961 was dead by 1968, and another ringed in 1975 was dead above a metre (three feet) up by August 1976.

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Observers: C. B. Ashby, G. Beven, D. A. Boyd, H. J. Burkill, S. H. Chalke, N. Curnow, P. W. E. Currie, E. M. Forsyth, K. Golding, R. W. Hayman, Ella M. Hillman, R. Kettle, L. Manns, W. D. Melluish, I. Menzies, A. Merritt, A. N. Piper, F. C. Reeves, I. F. Swinney, D. A. White, A. R. Wilton.

Book Review

A Key to the Case-Bearing Caddis Larvae of Britain and Ireland. By I. D. Wallace, B. Wallace and G. N. Philipson. Freshwater Biological Association. Scientific Publication Number 51. 1990. 237 pp. 93 full-page text figures (90 in multiple). £16. ISSN 0376-1887. ISBN 0 900386 49 5.

This latest F.B.A. publication was received after we went to press, but it is felt that notice of its appearance should not be delayed. This must be one of the largest of the series to have been produced and has been made possible with generous commercial sponsorship, duly acknowledged by the publishers.

Case-bearing caddis larvae can be found in a wide range of habitats from streams and rivers, from temporary seasonal trickles, between tussocks in bogs, from leaf-filled pools in woods and in salt marshes. One British species is totally terrestrial, being known only from the Wyre Forest area. Up till now the ecology of the case-bearers has been hampered by the lack of up-to-date identification keys and it is hoped by the F.B.A. that the present publication will redress the situation. Some caddis larvae (both cased and uncased) are important indicators of water quality. In recent years much public concern has been aroused by river pollution and a considerable amount of monitoring has been done on the rate of recovery and the effects of the pollution on the ecosystem. Readers of this journal will be up to date on the fate and state of a number of London's rivers and streams. Of the 152 species of case-bearing caddis in the check-list, 42 have not been recorded authentically from Ireland, whilst two Irish species have not been recorded in Britain.

The introduction covers collection, preservation and examination and is followed by three large, clearly-labelled drawings of the key characters and morphological features of the larvae, study of which quickly provides a good general idea of the insects. The key to families is very straightforward and in the keys to species which follow, each family is prefaced by a short introduction which users are urged to read carefully to enable them to ensure they have arrived at the appropriate family. Brief notes on the habits and general biology are included at this stage. The species are keyed out with reference to a number of features which seem to be relatively straightforward. Also, certain key characters are indicated by guide lines which assist in making a decision in cases of difficulty. Following each species' 'outlet' in the keys are brief general notes on its morphology and a short paragraph on habitats, relative abundance and distribution.

This work should be very well received, not only by well-established amateur and professional limnologists, but also I am sure, by our own members who are active at Bookham Common, Hampstead, Epping Forest, or elsewhere.

K. H. Hyatt

Botanical Records for 1989

by Rodney M. Burton*

Summary

A selection is given of the most interesting plant records made in the London Area in 1989 by members of the London Natural History Society and others.

Introduction

This paper follows the arrangement of its predecessors, grouping records of plants made in the London Area, here understood to be a circle of radius 20 miles (32 km) with its centre at St Paul's Cathedral, according to the vice-counties into which Great Britain was divided by Watson (1873), and within each of the vice-counties represented in the Area, dealing first with plants recorded in those parts which are in the present boundaries of Greater London.

V.C. 16, West Kent

First to be mentioned are some in the London Borough of Lewisham dating from 1988, although they did not come to notice in time to be included in last year's paper. John Archer of the London Ecology Unit found bitter vetch *Lathyrus montanus* at the Garthorne Road Nature Reserve, Forest Hill, and reported Nick Bertrand's fiddle dock *Rumex pulcher* from the centre of Deptford and purging flax *Linum catharticum*, fleabane *Pulicaria dysenterica* and fern grass *Catapodium rigidum* at Bell Green Gas Works. A few other 1988 records did not reach me in time but are nevertheless very welcome; it has to be understood that in any case only a small portion of the records received each year can be selected (arbitrarily, by me) for individual mention. Geoffrey Kitchener's dittander *Lepidium latifolium* on a railway bank north-west of New Cross is the best 1989 record from former Kent so far into London; Mr Kitchener has been mentioned many times here in the last few years on account of his researches into the occurrence of maritime plants on the verges of major roads treated with de-icing salt in winter; in 1989 these plants included the grass *Puccinellia distans* unusually close to London on the A20 just beyond the South Circular Road. The London Borough of Bromley includes a large area of rural character which the boundary-drawers of the 1960s included in the new county of Greater London; High Elms, where Mr Kitchener found *Conyza sumatrensis* still in flower on 14 January 1989, on the disturbed woodland floor from which trees felled or damaged by the storm of October 1987 had been removed, is very different from the warm urban situations most favoured by this alien, not long ago reported for the first time as naturalised in Britain (Burton 1985). John Palmer's note of *Cotoneaster sternianus* at Bickley is accompanied by a warning that many earlier years' records of species in this commonly bird-sown genus of ornamental shrubs need correction, following redetermination of specimens by J. Fryer, who has prepared an account of the genus for the *European Garden Flora*, or by B. Hylmö in Sweden.

Most of the 1989 records in the long list supplied by Mr Palmer are alien species growing in that part of the London Area which is still in Kent, which in many cases he has known for long enough to be able to indicate that they have genuinely become established; as an instance I will cite Chinese lanterns *Physalis alkekengi*, a rhizomatous plant grown in gardens for its ornamental fruiting calyces, of which he knows a strong colony at the edge of a field at Hextable adjacent to the back of a garden. There are also native species in his list, however, such as the rare cornfield weed *Papaver hybridum* at South Darenth. Mr Kitchener reports two plants of autumn lady's-tresses *Spiranthes spiralis* in

*Sparepenny Cottage, Sparepenny Lane, Eynsford, Kent DA4 0JJ.

a garden lawn, and at Lullingstone the night-flowering catchfly *Silene noctiflora* as a field weed and foxtail barley *Hordeum jubatum* introduced originally as a grass-seed impurity growing very well on a heap of cuttings. He had been to Lullingstone to see the small teasel *Dipsacus pilosus* which I had found at a point where the storm of October 1987 had taken out a riverside tree. Further south in the Darent valley, Geoff Joyce found a plant of shepherd's-needle *Scandix pecten-veneris*, last seen in the London Area at least 15 years before, among pick-your-own strawberries at Sepham Farm, Shoreham. I learned of this both from Dr Joyce himself, who also pointed it out as a feature of interest to the farmer, and from Joyce Pitt who had learned of it through channels in the Kent Trust for Nature Conservation to which the farmer had reported it! Mrs Pitt's own records include a remarkable solitary rough mallow *Althaea hirsuta* by the main road at the foot of the chalk bank below Hollows Wood. This is not unlike the habitat in Kent beyond our area between Cobham and Cuxton where it is perhaps native, whereas the few previous records from the London Area are all of undoubtedly casual plants. Coincidentally, our meeting of 10 September 1988 had walked the length of this roadside without seeing this rarity, which implies that the 1989 record of it is also casual.

V.C. 17, Surrey

Mr Palmer's records include a new plant for Surrey, the hybrid of common and Chinese mugworts *Artemisia verlotiorum* × *vulgaris*, discovered new to science in the Lea Valley by Brian Wurzell in 1987 (Burton 1988). Mr Wurzell himself confirmed the identity of Mr Palmer's plant from Bermondsey and found others near Stockwell Station and in Burgess Park. Other metropolitan Surrey finds by Mr Palmer include *Conyza sumatrensis* in many places in Lambeth and Southwark, four different wall ferns and seedlings of various cotoneasters etc. near the Imperial War Museum, deadly nightshade *Atropa belladonna* in several places not far south of London Bridge Station, and a surprising native rush *Juncus conglomeratus* from Potters Fields, a street near the Thames in Southwark. Next nearest to Central London south of the Thames are Peter Holland's teasel *Dipsacus fullonum* on Clapham Common and great hairy willow-herb *Epilobium hirsutum*, with both white and red flowers, filling a neglected front garden near the Common.

Further out but still in London boroughs, Stella Luce's records include blinks *Montia fontana* near the entrance to East Sheen Cemetery and field pepperwort *Lepidium campestre* at East Putney, in a weedy garden accessible after building work. Stella and Elizabeth Norman independently told me about salsify *Tragopogon porrifolius* and the larger alien subspecies of goatsbeard *T. pratensis* subsp. *pratensis*, together with the hybrid between them, first found in Merton streets by Irene Kettle. Elizabeth's own records include the large alien mullein *Verbascum phlomoides* on Tooting Bec Common. Among records kindly communicated by Joyce Smith are greater yellow-rattle *Rhinanthus angustifolius* continuing to extend its range south of London, two patches having been found on New Addington Golf Course (A. Scott), seedlings of the rosaceous shrub *Stranvaesia davidiana* up to 25cm high on Wimbledon Common (John Hodge) and *Chenopodium murale*, flower-of-a-day *Hibiscus trionum* and *Erucastrum gallicum* at Sutton (M. J. Dyke). Julia Leslie and Ken Page found a mixture of unexpected plants near the Kingston By-pass, including suckers of the wing-nut hickory *Pterocarya fraxinifolia*, a small tree of the smooth-leaved elm *Ulmus minor*, a single plant of the white-flowered alien *Erigeron annuus* and evidence of the continuing insidious increase of *Bromus carinatus*. Near Cuddington Golf Course, just within the boundary of Sutton, Mr Page and Bryan Radcliffe's finds included a single plant of knapweed broomrape *Orobanche elatior*, dozens of seedlings and saplings of the large-leaved lime *Tilia platyphyllos* and two vegetative clumps of madonna lily *Lilium candidum* with no obvious historical connection to any garden. Both the last two lists include the garden shrub *Symphoricarpos* × *chenaultii*; plants of this genus are

much grown for their berries, which are attractive to human eyes but said to be ignored by birds.

Most of the more memorable records from the Surrey part of our area outside London boroughs are due to Barry Phillips at Chertsey. On the side of St Ann's Hill, Barry showed me good old wild trees of service *Sorbus torminalis* and crab-apple *Malus sylvestris*. Parts of the pasture below were full of splendid specimens of fragrant agrimony *Agrimonia procera*, and by the gravel-pit across the lane *Cyperus eragrostis* is becoming naturalised. Where he took me to see meadow thistle *Cirsium dissectum* where he had found it on the other side of Chertsey, I was able to detect its hybrid with the marsh thistle, *C.* × *forsteri*, for the first time in the London Area. Other discoveries, vouched for by specimens which Mr Phillips was able to show me, include *Potentilla anglica* on St Ann's Hill, white mignonette *Reseda alba* by Wick Lane and least gorse *Ulex minor* on a bank by the M3 motorway; it is impossible to judge whether this was put there or had spread naturally from the motorway cuttings on Chobham Common where it appears quite natural. He knows the plants of Chertsey Mead well, which still include clustered bellflower *Campanula glomerata*, and fine-leaved water-dropwort *Oenanthe aquatica* nearby at Hamm Farm.

Mr Kitchener's Surrey plants include the first record for that county of the lesser sea-spurrey *Spergularia marina*, which he reported well established at the M25-A217 road junction. Mrs Smith communicated D. Hill's record of *Bupleurum falcatum* from a garden below Colley Hill, Reigate; this is not much more than a mile away from a spot where it was known for a short while about 120 years ago, but is likely to have been introduced independently, perhaps with bird-seed.

V.C. 18, South Essex

Most of our 1989 records from this vice-county come within the area of London boroughs. Mr Archer found large patches of strawberry clover *Trifolium fragiferum* on the 'Beckton Alps' and centaury *Centaurium erythraea* and an eyebright *Euphrasia* sp. on a small piece of waste ground near North Woolwich Station. Strictly speaking, the latter locality ought to be treated as being in v.c. 16, having been in Kent at the time of Watson (1873), as pointed out by Mitchell (1984), but this historical point having been overlooked hitherto in our records I will have to continue to ignore it. Mr Palmer found a quantity of an alien willow *Salix elaeagnos* at Stratford; I suspect that these were planted, even though this would not be evident at the site. Ann Boucher reports *Conyza sumatrensis* occurring occasionally for a mile along Markhouse Road, Walthamstow. Mr Holland sent me a list of remarkable plants which he and Margaret Kennedy had found in a detached remnant of Epping Forest near Highams Park; the presence of flowering rush *Butomus umbellatus*, galingale *Cyperus longus*, arrowhead *Sagittaria sagittifolia* and New Zealand waterweed *Crassula helmsii* together indicate some deliberate introduction, but can that be said of small water-pepper *Polygonum minus* which was with other native persicarias, or of *Corydalis claviculata* which has never been seen before in this well-botanised area?

In the part of the area which is still administratively in Essex, Mr Holland and Miss Kennedy found viper's bugloss *Echium vulgare* of casual occurrence on the motorway bank by Bellhus Wood and *Lemna minuscula* in Thorndon Country Park. Our meeting of 15 April went to Warley Place which is well known for its long-persistent garden relics: I do not believe that *Scilla bithynica*, which is very well established, has been mentioned from there before.

We have no 1989 records from vice-county 19, North Essex.

V.C. 20, Herts

Only a small part of this vice-county is in a London borough. Diana Griffith

found water-fern *Azolla filiculoides* in three ponds at Totteridge, one of which was completely covered by it in early spring, showing as a continuous red (except where broken by logs) in her photograph, though there was no trace left in October. Also at Totteridge Dr Griffith found uncommon sedges *Carex muricata* and *C. nigra,* the former determined by S. Karley, in the well-known old grassland of this area.

As usual in recent years, most of our Herts records have been contributed by Mrs Boucher. I select for mention here great wood-rush *Luzula sylvatica* 'common' in Wormley Wood; bladderwort *Utricularia vulgaris* in water almost exactly 20 miles from St Paul's; sneezewort *Achillea ptarmica* by the lake of Balls Park College; five plants of green-ribbed sedge *Carex binervis* in woodland on Hertford Heath, confirming Mr Dony's 1955 record; bitter vetch *Lathyrus montanus* and a single stem of herb Paris *Paris quadrifolia* in Balls Wood; and a group of about 100 plants of oak-leaved goosefoot *Chenopodium glaucum* at Hailey Farm, Hoddesdon. She reports that the aliens coming up on the sludge tips at Rye Meads Sewage Farm were particularly good in 1989, including *Sesamum indicum* and *Solanum cornutum.* The latter name is probably intended to refer to the same species as *S. rostratum* which was found with *Hibiscus trionum* by Olive Linford and others at Garston near Watford.

V.C. 21, Middlesex

Those last were passed on to me by David Bevan, whose own best find in 1989 was certainly the hybrid of wavy bitter-cress *Cardamine flexuosa* and cuckoo-flower *C. pratensis* at Bentley Priory, confirmed by T. C. G. Rich. This plant has not previously been reported from Middlesex, and the specimens known to Dr Rich have a different petal colour, suggesting that the new plant, present as quite a large clone in the habitat shown by Mr Bevan's photograph in the Frontispiece of this issue, is a different nothomorph, *i.e.* it has a different race of *C. pratensis* as its parent from previous occurrences. The name for the hybrid is often given as *C.* × *haussknechtii* O. Schulz, but Douglas Kent, who is currently preparing a nomenclatural check-list of the British flora, has pointed out the older name of *C.* × *keckii* A. Kerner. Mr Bevan also reports a single plant of spotted orchid *Dactylorhiza fuchsii* on the Parkland Walk, a peach *Prunus persica* with ripe fruit at Coppetts Wood and a large suckering clone of an alien maple *Acer cappadocicum* at Trent Park. He passed on records of another large clone of this tree at Hadley Wood found by Brendan Knell, rough chervil *Chaerophyllum temulentum* which is rare in Inner London by the Regent's Canal in Camden Town and rocket *Eruca vesicaria* by a Tottenham roadside found by Brian Wurzell, freely regenerating Indian horse-chestnut *Aesculus indica* and a garden holly *Ilex* × *altaclarensis* found in Queen's Wood, Highgate by Ted Tuddenham and the yellow-flowered garden annual *Saxifraga cymbalaria* at the north edge of Stanmore Common, and narrow buckler-fern *Dryopteris carthusiana* (identified by Michael Mullin) in Denham Lock Wood found by Howard Matthews. The latter is possibly not a new discovery, but needs to be mentioned as it had been thought possible that it too was a hybrid. Trent Park was also the venue of our meeting of 1 October, when new populations of harebell *Campanula rotundifolia* and common yellow sedge *Carex demissa* came to light. Records extracted from the reports of two meetings of our South-West Middlesex Section also merit mention. On 17 June they found seven bee orchids *Ophrys apifera* and one *Dactylorhiza fuchsii* at Bedfont Gravel-pits, and at the old marshalling-yards at Feltham on 8 June they were shown the alien crucifer *Rhynchosinapis cheiranthos.* In other parts of Britain this has become established, often near railways, but the only previous record from London was obviously casual. The terms in which the plant was described in the report of the meeting mentioned encourage suspicion of confusion with a *Diplotaxis* species, but I had one other independent record of *Rhynchosinapis* from Feltham in 1989.

Mr Kent is the Botanical Society of the British Isles' recorder for vice-county 21, and as such has received a number of interesting records which he has kindly passed on to me. In the grounds of the Natural History Museum at South Kensington, John Cannon, who recently retired as Keeper of Botany there, was the first to see a large plant of the alien mallow *Malva nicaeensis*, identified by Mr Mullin. Mr Mullin also confirmed the identity of the hybrid woundwort *Stachys* × *ambigua* found in good quantity on the island in Crane Park by J. Hywel-Davies and he himself found a curious assortment of species in the churchyard of Holy Trinity, Brompton: *Chaerophyllum aureum*, *Duchesnea indica* and *Smyrnium perfoliatum*. Raymond Harley found two patches of the musky cranesbill *Erodium moschatum* on waste ground at Teddington. Mr Kent found a single large plant of Himalayan honeysuckle *Leycesteria formosa* bird-sown in a street in West Ealing which he believed to be the first record for the vice-county, but I received and neglected to publish a similar record of this popular garden shrub from near the Barbican in 1987 by J. E. Harvey, and I have also identified it from material collected near the Brent Reservoir by Leslie Williams.

Last year's records (Burton 1989: 153) mentioned a list of plants in Hyde Park and Kensington Gardens made by Elinor Wiltshire. Mrs Wiltshire's additions in 1989 are just as remarkable; they include a plant of a more or less tropical grass *Arthraxon hispidus* (Thunb.) Makino near Palace Gate, not previously recorded in Britain, determined by Mr Mullin, fiddle dock *Rumex pulcher* in the grass on the west side of Buck Hill Walk, *Heliotropium europaeum* near the tennis courts in Hyde Park, musk-flower *Mimulus moschatus* as a weed north-east of the Albert Memorial which was removed soon after she found it, and true chamomile *Chamaemelum nobile* in the lawn south of Kensington Palace.

Sites in the Borough of Islington were investigated in great detail for the Islington Wildlife Survey, and a list of the principal discoveries kindly communicated to me by David Curson. Of these I can select only a few for mention here: lady fern *Athyrium filix-femina* and hartstongue *Phyllitis scolopendrium* on old walls at St Mary's Church, Upper Street; sickle medick *Medicago falcata* at Orleston Road Council Depot; a plant of slender birdsfoot-trefoil *Lotus tenuis* at Freightliners Farm, which it is suggested was introduced accidentally in hay; and lady's bedstraw *Galium verum*, mouse-ear hawkweed *Pilosella officinarum* and seedlings of heather *Calluna vulgaris* by flats at Claremont Close, Pentonville. The heather was by a path behind, the others in grass in front, and it seems likely that all were introduced accidentally with turf and other garden material, but the impression is given of a patch of acid grassland in improbable surroundings.

Many recorders already mentioned under other counties also made worth-while contributions from boroughs in vice-county 21. Mrs Norman found well-naturalised pampas grass *Cortaderia selloana* by the A40 near Northolt and more centrally a group of plants including mullein *Verbascum thapsus* and weld *Reseda luteola* by the railway near Warwick Road. Mr Kitchener mentions four *Cotoneaster* × *watereri* and one yellow vetchling *Lathyrus aphaca* on waste ground at Bishopsgate Goods Yard. Mr Palmer reports *C. hissaricus* and another species, perhaps *C. turbinatus*, as being frequently self-sown in and around the Victoria Embankment Gardens. Mr Holland and Miss Kennedy saw duckweed *Lemna minor* in a small trickle of water near the Thames at Wapping.

Two records scarcely less remarkable than any of those above remain to be mentioned. The last record of mousetail *Myosurus minimus* in Middlesex is represented by a specimen collected by J. E. Cooper in the very north of the county near Potters Bar in 1914. In 1989 R. Skipper found two small plants of this rarity, together with the field pansy *Viola arvensis*, in Brompton Cemetery. He was uncertain whether to regard his discovery as a native plant which had germinated after a very long period as a result of some rare chance combination

of circumstances, or an accidental introduction of some kind; to me the third possibility of a deliberate introduction seems no less unlikely than either of the other two. Veronica Edmonds sent me a specimen of a mint which she had found in a back alley between houses in Southall, which I identified as pennyroyal *Mentha pulegium*. The origin of this is equally problematical, though at least there is the possibility of stock or seed intended for a herb-garden.

The portion of vice-county 21 which is not in a London borough is rather smaller. At Littleton Lakes our South-West Middlesex Section found a number of interesting plants on its meeting on 9 September, of which the most unusual is pickerel-weed *Pontederia cordata*, an ornamental aquatic which is being reported out of cultivation fairly often nowadays, though it appears to persist seldom. Mr Kent communicated records of two plants of early marsh-orchid *Dactylorhiza incarnata* found by Phillip Cribb and Tom Cope at Kempton Park, *Malva nicaeensis* on Shortwood Common found by Mr Mullin and the hybrid of curled dock and marsh dock *Rumex* × *areschougii* found at a gravel-pit near Shepperton by Dr Rich and confirmed by himself.

We have no records to mention this year from vice-county 24, Bucks.

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Obituaries

ALAN MAURICE EASTON, M.D., 1907-1989

Dr Alan Easton, who died on the 15 April 1989 at the age of 82, had been a member of The National Trust Management Committee for Bookham Common from 1941 to 1978 when he was forced to retire because of ill health. During his long term as Chairman the Common was made a Site of Special Scientific Interest. He joined the London Natural History Society in 1944 and became very involved in our survey of the Common. Although a good general naturalist his main interest was Coleoptera and between 1946 and 1952 he contributed five papers on the beetles of the Common.

Educated at Whitgift School, Croydon and trained at St Thomas' Hospital, he was an exceptional scholar, gaining scholarships and prizes every year of his studies. He graduated in 1929, started a general practice in Great Bookham, Surrey in 1930 and lived there for the rest of his life. He ran his practice single handed until the nineteen fifties when the practice had increased to the extent that he had to employ assistants and then, in 1970, a partner. In 1940 he was appointed G.P. Consultant Surgeon at Leatherhead Hospital and was Police Surgeon for Dorking, 1949-84 and Reigate, mid-1970s-1982.

As well as making an excellent general collection of Coleoptera and adding several species to the British list, some of them new to science, he specialised in the large and difficult genus *Meligethes* (Nitidulidae). He first studied the British species, many of which he reared to determine their food plants and parasites. He was then able to contact botanists around the country and obtain accurate localities for the more uncommon food plants and visit them at the right time of year to collect. In addition he made general collecting trips to most of the vice-counties, amassing a large amount of distribution data for the genus. This, however, was only a small part of his work. Between 1944 and 1968 (when his practice took up all of his time) he published 44 papers on the genus worldwide including monographs on the European, North and East African, Abyssinian, S.W. Arabian, Afghan, Nepalese and Japanese species.

An important part of his police work was the forensic examination of corpses found in the area. He was, on some occasions, able to use his knowledge of the succession of Coleoptera attracted by them more accurately to calculate the time of death than he could by more conventional methods. He became interested in this problem further and in 1966 published a paper on the Coleoptera of a dead fox on Bookham Common, including two species new to Britain. However, he later realised that more accurate information could be obtained from dipterous larvae and worked with the experts, Dr H. Oldroyd and then K. G. V. Smith, at the British Museum (Natural History). In 1970 he published a joint paper with K. G. V. Smith, *The Entomology of the Cadaver*, which stimulated further interest in the subject.

He went as medical officer on the British Schools' Exploring Society expeditions to central Iceland in 1960 and to arctic Norway and Sweden in 1974 — at the age of 67.

Shortly before his death he was happy to donate his *Meligethes* collection to the British Museum (Natural History). Recently, with the agreement of his family, his British collection was also given to the Museum.

I would like to thank Mr M. E. Bacchus for much help in compiling the foregoing, especially with regard to the work of Dr Easton on Coleoptera.

GEOFFREY BEVEN

MARGARET GOOM, B.SC., 1912-1989

With the death of Margaret Goom in Lincolnshire on the 17 May, 1989, the Society has lost a loyal and valued former member, and Norah a much loved sister and companion.

Margaret was born on the 6 January, 1912 and lived in Teddington until her retirement. After leaving Twickenham County High School she worked at Guy's Hospital Dental Department in a mainly clerical capacity, while studying for a degree at Birkbeck College. She gained a B.SC. in Zoology with Botany as a subsidiary subject, and in the 1940s, her lifelong habit of scientific enquiry showed itself in her independent, spare-time research into grain weevils. Subsequently employed by the Chartered Society of Physiotherapy, she joined its editorial team working on that society's journal. Upon retirement Margaret joined Norah in Lincolnshire and for a time worked in hospital administration in Boston, until the difficulties of rural cross-country transport proved insurmountable.

Joining the Society in 1930, Margaret was for several years a committee member of the South-West Middlesex Section, which she ably represented on Council, whilst for a number of years she was an active member of the Ornithology Committee. Ornithological expertise and scrupulous regard for accuracy were happily combined in her service for twenty years – from its inception in 1947 – on the Government Committee on Bird Sanctuaries in the Royal Parks, as the Official Observer for Bushy Park and Hampton Court. She also took part in wildfowl counts at Kempton and Hampton Reservoirs, and in the annual heronry censuses.

In her years of retirement in Lincolnshire Margaret was able to devote herself to her lifelong interests, not only ornithology, in which field she will be especially remembered within the Society, but also botany and entomology, painting and music – she was a dedicated Wagnerian.

Beneath a retiring manner Margaret possessed a steely intellect with a fastidious regard for integrity in scholarship and indeed, in every aspect of life. A warm and witty friend, she is greatly missed.

V. F. HANCOCK

GEOFFREY BEVEN, M.D., B.SC., F.Z.S., M.B.O.U., 1914-1990

With the death on 11 March 1990 of Dr Geoffrey Beven, the London Natural History Society has lost one of its most respected and dedicated members.

In the years before the Second World War, Beven was one of two young ornithologists who met on most weekends at such well-known sites as Beddington and the various reservoirs and gravel pits in the London Area. Together with Dr W. W. Thomson, a general practitioner in Norbury, a lasting friendship was formed, both in the field and in frequent correspondence. Thomson possessed the enviable ability, denied to many, of finding nests however well concealed or however discrete the parents, and this trio of watchers returned summer after summer to Mitcham Common to work out the territories and nesting success of the red-backed shrikes which then nested there. A joint paper on Beddington was written, but not published, and further opportunities for working together in the field came from participation in the monthly duck counts under the watchful eye of R. C. Homes. Beven's life-long commitment to providing notes, articles, papers, reviews and other contributions to numerous scientific journals, periodicals, part-works and books had started in 1938, when his first paper 'Birds of Morden District' appeared in two parts in the *Journal of the Wimbledon Natural History Society*.

By September 1939 Beven was working for his finals and transferred from King's College to Horton Hospital, Epsom, in a unit set up to cope with the expected flood of casualties if air raids began. A pointer to his dedication to precise note-taking was contained in a letter to one of the friends: 'I sometimes think my bird notes are my most valuable possession', he wrote. 'They are quite irreplaceable and I would be upset if they were destroyed.' After obtaining his M.B., B.S. in November, Beven became Resident Medical Officer at Horton. The almost immediate arrival of large numbers of patients from the British Expeditionary Force in France initiated his professional career, and after a year at various hospitals Beven entered the Royal Air Force in November, 1940. Volunteering to do anything and go anywhere, he spent a year on airfields and training establishments before commencing the hazardous journey by sea to South Africa. During 1940 he had joined the L.N.H.S.

Having survived the perils of the journey, during which his ship became separated from the convoy, Beven took up his duties as Medical Officer at the R.A.F. Station at Oudtshoorn, Cape Province. Utilising to the full any free time and periods of leave, his bird list had reached 222 species by May 1942, and found expression in 'Some Notes from Oudtshoorn', a four-page article in *The Ostrich* in 1943. Beven was fortunate in meeting M. F. M. Meiklejohn when in the Transvaal, and continued to use off-duty time to such good effect that he became a regular contributor to *The Ostrich*, the definitive ornithological journal in The Cape. Between 1943 and 1946 twelve articles appeared, with an isolated contribution in 1949. In terms of his devotion to survey and census research, which was to culminate after the war in the monumental work at Bookham, 1943-46 may now clearly be seen as the formative years. 'An Area Census in Zululand' and 'Relative Counts in Indigenous Forest' were published in 1945.

The L.N.H.S. was not forgotten, and in 1944 *The London Naturalist* No. 23 included a paper 'European Migrants in South Africa', compiled from observations over a period of twenty months. Beven's membership of the British Empire Naturalists' Association dated from 1938 or earlier, and the December 1943 issue of its journal *Countryside* carried an article on 'Rare British Birds in South Africa'. Throughout the war a regular correspondence was maintained by the now widely separated but steadfast trio of friends from the old days at Beddington, and Beven's long and detailed letters from Oudtshoorn and Durban were greatly prized. Service personnel serving at The Cape were

sometimes able to hitch a ride to other parts of Africa. This was seen by Squadron Leader Beven, as he became, as a golden opportunity to visit some of the game reserves, and was the beginning of a passion for the great herds and noble beasts of the continent which drew him back to Africa at intervals for the rest of his life. Beven developed a rare talent for photography, and his slides of the birdlife and big game of Africa were much enjoyed — and even now remembered — when shown in the course of his lectures to the Society. If the conversation should turn in that direction, visitors to his home at Esher would count themselves fortunate if allowed to examine the extensive photograph collection, methodically arranged and indexed, many of exhibition standard.

Following demobilisation, Beven resumed his medical career in England and obtained his M.D. in 1950. A paper on 'Childbearing and Tuberculosis' was read before a meeting of specialists at Grove Park Hospital in 1951, and repeated with additions at a meeting of the British Tuberculosis Association in July of the following year. His paper 'Monocytic Leukaemia and Pulmonary Tuberculosis' appeared in the *British Medical Journal* in December 1951, and it became evident that much of Beven's work, with others, in the fifties was in the forefront of the research which was to conquer so dramatically the scourge of tuberculosis. Between 1951 and 1957, a series of notable papers appeared in Tubercle and in the *Journal of Obstetrics and Gynaecology*, the *British Journal of Tuberculosis* and the *Transactions of the Third Commonwealth Health and Tuberculosis Conference*. After transferring to Ealing Chest Clinic and later to Ealing Hospital, Beven became Consultant Chest Physician, a post which he held with great distinction until his retirement in 1979.

Always modest and unassuming, Beven gave little hint to his field companions of the nature of his professional work in those crucial years. The ability to switch a restless and enquiring mind to other aspects of the life sciences ensured that in the related fields of ecology and natural history a line of enquiry would be clearly identified and carried through with perception and integrity. 'It has always seemed to me', Beven said in a speech to the 1937 Bird Club, 'to be quite natural to count birds, whether parties, flocks or breeding pairs'. In his Presidential Address to the L.N.H.S. in December 1967, Beven outlined the first twenty-five years of the Bookham Survey, a project in which he himself had taken an active part since 1949. A census of the breeding birds in 40 acres of Eastern Wood had been made, and the results worked out and published, in every year except 1957. A detailed paper, concentrating on this aspect of the work at Bookham, appeared in the 1976 *London Naturalist* (No. 55) and discussed the changes in the breeding bird populations which had become evident in the course of the survey. Beven was always at pains to acknowledge the efforts of others whose help made this possible year by year, but there is no doubt that he was not only the chronicler of this long-running survey, but also its prime mover and a tireless worker in the field.

It was inevitable that census work on this scale would generate interest nationwide, and in the 1971 Annual Report of the Norfolk Naturalists' Trust there appeared a paper entitled 'A Thirty Year Survey of the Natural History of a Surrey Common'. Even as early as 1963, Beven had been invited to produce a paper on the subject for *British Birds*: 'Population Changes in a Surrey Oakwood During Fifteen Years'. Already well known to readers of that journal for his acute observation of the behaviour of birds, both in this country and abroad (20 published notes between 1944 and 1966), Beven contributed between 1966 and 1974, and jointly with M. D. England in 1977, nine articles under the series title 'Studies of Less Familiar Birds'. Species such as the blue rock-thrush, sub-alpine warbler and red-necked nightjar featured in these accounts, which owed much to Beven's personal fieldwork in supplementing and bringing into focus the often meagre and scattered published information

Dr Geoffrey Beven examining birches felled by beavers, Central Sweden, 1955.
Photo: C. B. Ashby.

previously available. Such diverse observations as 'Simultaneous Hunting by a Pair of Bonelli's Eagles' and 'Hen Blackbird Striking Human Instruders in Defence of Nest' continued to enliven the pages of *British Birds,* and a total of 29 behaviour notes of this kind were published, the last in 1986. The perceptive question 'Does the Buff-backed Heron Really Remove Ticks from the Bodies of Animals?' was asked in volume 88 (1946) of *The Ibis,* the Journal of the British Ornithologists' Union — of which Beven was a member for many years, and through which he met and conversed with many leading ornithologists on terms of cordiality and mutual regard.

When in 1969 I.P.C. Publications launched their *Birds of the World,* edited by John Gooders, Beven's ability to produce highly readable but totally factual species accounts was again in demand. The black woodpecker, rufous bush robin and malachite sunbird were among the ten species described. It became a matter for general regret that John Gooders' extremely well-produced monthly, *World of Birds,* the first issue of which appeared in 1971, failed to stay the course and disappeared after a few years; but not before Beven, and such of his field companions as John Wightman and Derrick England, had contributed some splendid illustrated articles. Drawing on his by now extensive experience of birds worldwide, Beven provided profiles — with full sets of references — of, among others, the fantail warbler and great grey shrike. A paper, written jointly with M. D. England for *British Birds* in 1969, examined the habits of shrikes in impaling their prey; and was followed in 1972 by an article on shrikes in volume 18 of the *Encyclopaedia of the Animal World,* published by Elsevier. Sections on the social pattern and behaviour of birds in volume 2 of *The Birds of the Western Palearctic* (1980) were contributed by Beven for the crane, the demoiselle crane, the little bustard and, with N. J. Collar, for the black-winged kite; in volume 3 (1983) part of the habitat section for Kittlitz's sandplover; in volume 4 (1985) seven references, including tables on the feeding of the tawny owl in London; and in volume 5 (1988) eight references.

It had been 26 years since Beven's first foray into the world of writing for books, with his chapter on 'The Woodlands' in the L.N.H.S.'s first book, *The Birds of the London Area Since 1900* (1957), edited by R. C. Homes. But authors of numerous other books had meanwhile made use, with due acknowledgement, of his published work. By 1988, no less than 57 titles were to greater or lesser extent thus indebted; ranging from *Woodland Birds* by Eric Simms (10 references), *The Parasitic Cuckoos of Africa* by H. Friedman, *The Owls of Europe* by Heimo Mikkola and volume 2 of *The Birds of Africa* by Urban, Fry and Keith; to *Owls of the Northern Hemisphere* by Voous (1988), and *Encyclopaedia Britannica.*

Beven was always an enthusiastic reader and collector of books, and his personal library expanded in time to almost every room of the house. Such was his wide circle of friends and colleagues that more than fifty of these books are either signed by the author or have authors' letters within them. Although Beven made full use of acknowledged references, by far the major part of his published output was directly related to his own extensive experience in the field, and particularly relied on the self discipline which required everything to be written down, if not as it happened, then as soon as possible thereafter.

In the field, Beven was the perfect companion. The writer cherishes the recollection of many excursions together; as for example the excitement of locating a nesting pair of snow buntings on the cloud-enshrouded heights of the Cairngorms; of climbing tall pines in Scandinavia to view but not touch the nests of osprey and goshawk; of negotiating swamps and etangs in the Camargue in the quest — eventually successful — for nesting flamingoes; and, of course, fieldwork, sometimes by night, at Bookham. To others fell the pleasure of sharing expeditions to Spain, Portugal and elsewhere; but the writer's collection of postcards from many parts of the world are a graphic reminder of a life lived to the full. Most poignant perhaps were those of the latter years when, although

so severely disabled, an iron will took him yet again to Africa; there to watch the great migration of the wildebeest, and deploy his binoculars one-handed.

Members who have joined the Society in recent years will have had few opportunities to meet and talk with Dr Beven. The disability resulting from a stroke in January, 1980 abruptly put an end to his appearance at the Society's meetings, at which formerly he was a frequent attender and a much-respected key figure; but did nothing to quench his enthusiasm for the Society or his determination to continue to take an active part in it. With his mobility seriously restricted and his writing arm unable to function, the strength of will which led to the recovery of speech also forced an unaccustomed left hand to provide within a very few months a neat and legible script. Thus began a memorable last chapter in the life of one whose outstanding achievements in the worlds of natural history and medicine earned him lasting recognition.

From the outset, Beven had collected the skulls of small mammals, birds and other creatures found dead, sometimes using ants as the unwitting agents of the cleaning process. With the benefit of this useful reference collection, and his knowledge of vertebrate anatomy, Beven was well placed to undertake the patient evaluation of the pellets of owls and other species in order to establish the nature of the food. The results of this research were given initially in two papers: 'The Food of Tawny Owls in London', in the 1965 *London Bird Report*; and 'The Food of Tawny Owls in Surrey', published in the 1967 *Surrey Bird Report*. Through the kindness of Mrs Beven, the writer has been allowed access to many of Dr Beven's files and records, including a great deal of original material in connection with this research. After the publication of the original papers, Beven continued to analyse and record large numbers of pellets found by himself, supplemented by others sent to him by various helpers and correspondents. From 1980 onwards it is noticeable that the entries on the schedules are in the left-handed script. Refusing to allow infirmity to deflect him from his purpose, Beven completed his paper 'Further Observations on the Food of Tawny Owls in London', which appeared in 1982 in *The London Naturalist* No. 61. This was based on material examined between 1966 and 1980, and from its including much complicated information in tabular form would have been a tour de force for even an able-bodied typist; one may marvel at the accuracy and determination of an author whose only typing arm was his left.

There is no doubt that the post-1980 years were beset with such adversity that courage of the highest order was called for. It has been his custom to encourage members of the Bookham team to write up their records for publication in the *L.N.* each year, leaving him to do the same for the birds and other orders. In addition, he had found time to produce such useful summaries as 'The Feeding Sites of Birds in Grassland' in *L.N.* No. 43; and 'Variations in Bird Populations in Scrubland on Bookham Common', which appeared in No. 18 of the *Surrey Bird Report* and sought to relate bird numbers to observed changes in habitat, and especially to conservation management. His contribution to the 1980 Progress Report in the *L.N.* was understandably brief, but memorable for its frankness. Thereafter, the annual Progress Reports represented nothing short of a declaration of war against the mounting forces of infirmity.

Beven had always held, indeed with truth, that however much had been achieved the point of finality was not yet. In the Report for 1981 he wrote: 'Natural history is never static, especially in an area subjected to management ... Although 85 papers have already been published, there are still various groups not yet written up'. These omissions he set about rectifying. Drawing on a retrieval system which owed nothing to modern technology, but everything to a well-ordered if voluminous set of files, Beven produced each year historical summaries for selected species and groups. In 1981 and 1982, amphibians and reptiles and a review of the status of the magpie; in 1983, the same for woodcock, pipits, wagtails and warblers; in 1984, starling roosts, little grebe,

Scolopacidae and Rallidae; in 1985, Anatidae and Strigidae; in 1986, Laniidae, Bombycillidae, Fringillidae, Emberizidae, the grass snake and the brown hare; in 1987, Accipitridae, Turdinae and the hedgehog; in 1988, the harvest mouse, the dormouse and further detailed summaries of the Fringillidae.

In 1982 Geoffrey Beven was made an Honorary Vice-President of the L.N.H.S.

Readers of this obituary will have in their hands the Progress Report for 1989 of the Bookham Common Survey, Geoffrey Beven's last act of dedication to the Society. By dint of persuasion and persistence which would not be denied, he had ensured the timely submission of texts by all contributors; to which he added his own and completed everything within the Editor's deadline. As the youngest member of that early, pre-war trio of friends, the writer received the news of Geoffrey's death on Sunday 11 March 1990 with a profound sense of deprivation. To Suzanne, Paul, Mary and Rosemary, members of Geoffrey's close-knit and loving family, we acknowledge that their loss is unmeasurable; as indeed is the stature of one whose achievements will long be valued and remembered.

C. B. Ashby

Dr Geoffrey Beven — An Appreciation

To me Geoffrey exemplified the best kind of field naturalist, whose interests were not confined to one narrow speciality. He brought to everything he did that meticulous attention to detail which he learned from his medical training, whilst still retaining the ability to stand back and take a general view. His long association with the Bookham Common Survey contributed a valuable element of continuity and his long series of annual reports reflect his personal knowledge of the changes and developments over more than 30 years.

Geoffrey was not a demonstrative person, not given to outward display of emotion; but his commitment reflected the enjoyment and satisfaction that he derived from his work for the Society and for the broader interests of the study of natural history. Not least of his contributions was his ability to communicate to others and to inspire them to emulate the high standards that he set for himself.

My most vivid memories are of our trip to Scotland, toiling up Ben Lawers, and of orchids and golden eagles in Ardnamurchan. Geoffrey was, of course, more to me than just a fellow member of the L.N.H.S.; he was my best man at our wedding.

P. W. E. Currie

Natural History Publications of Geoffrey Beven

Items marked ★ are contributions to the Society's **Survey of Bookham Common** and its annual **Progress Reports.** In the Progress Reports the overall pagination is given and subtitles are omitted.

1938. Birds of Morden district, 1. *J. Wimbledon nat. Hist. Soc.* 6 (1).
——. Birds of Morden district, 2. *J. Wimbledon nat. Hist. Soc.* 6 (2).
1939. Morden bird notes. *J. Wimbledon nat. Hist. Soc.* **7** (1).
1943. Some notes from Oudtshoorn. *Ostrich* **13:** 235-238.
——. (With W. L. Chiazzari). Waders, dikkops, coursers and common larks at Oudtshoorn. *Ostrich* **14:** 139-151.
——. White storks in winter (letter). *Ostrich* **14:** 189.
——. Rare British birds in South Africa. *Countryside* **12**, 9 December.
1944. Nesting of African skimmer. *Ostrich* **15:** 138-139.
——. Record of sooty tern at St Lucia. *Ostrich* **15:** 140-141.
——. European migrants in South Africa. *Lond. Nat.* **23:** 20-22.
——. Rudd's bush warbler (*Apalis ruddi*). *Ostrich* **15:** 178-187.

1945. An area census in Zululand. *Ostrich* **16:** 1-18.
——. Relative counts in indigenous forest. *Ostrich* **16:** 65-69.
——. The sooty tern in South Africa (letter). *Ostrich* **16:** 90-92.
——. Hobby eating birds in the air. *Br. Birds* **38:** 334.
——. The winter population in transitional scrub-bush at Grahamstown. *Ostrich* **16:** 83-95.
——. Courtship feeding of marsh tit. *Br. Birds* **38:** 354.
1946. Courtship display of the chaffinch. *Br. Birds* **39:** 23.
——. Does the buff-backed heron really remove ticks from the bodies of animals? *Ibis* **88:** 133.
——. Courtship presentation by starling. *Br. Birds* **39:** 116.
——. Feeding behaviour of North Atlantic shearwater. *Br. Birds* **39:** 122.
——. Some notes on song. *Ostrich* **17:** 51-60.
——. Some notes and records of South African birds. *Ostrich* **17:** 61-74.
——. (With W. W. Thomson). Courtship feeding of willow tit. *Br. Birds* **39:** 245.
——. Sun-bathing in hedge sparrow. *Br. Birds* **39:** 245.
——. Precoitional display of chiffchaff. *Br. Birds* **39:** 246.
——. Injury-feigning of blackbird. *Br. Birds* **39:** 248.
——. Food-washing habit of whimbrel. *Br. Birds* **39:** 249.
1947. Display of house sparrow. *Br. Birds* **40:** 308-310.
——. ★Birds (quoted observations). *Lond. Nat.* **26:** 82.
1948. Late reed warbler in Surrey. *Br. Birds* **41:** 118.
——. Autumn song of willow warbler in winter quarters (quoted note). *Br. Birds* **41:** 251.
——. Injury feigning of grey wagtail. *Br. Birds* **41:** 274.
1949. Breeding dates of game birds. *Ostrich* **20:** 95-96.
1950. ★Birds (quoted observations). *Lond. Nat.* **29:** 90.
——. Book review. *London's Birds*, by R. S. R. Fitter. *Lond. Bird Rep.* **14:** 59-60.
1951. Display of grey wagtail. *Br. Birds* **44:** 19.
——. Behaviour of robin in presence of adder. *Br. Birds* **44:** 23.
——. ★The bird population of an oakwood in Surrey (Eastern Wood, Bookham Common). *Lond. Nat.* **30:** 57-72.
1952. Coutship feeding of the meadow-pipit. *Br. Birds* **45:** 409.
1953. ★Birds and mammals (quoted note). *Lond. Nat.* **32:** 47.
——. ★Further observations on the bird population of an oakwood in Surrey (Eastern Wood, Bookham Common). *Lond. Nat.* **32:** 51-77.
——. Book review. *The Changing Wild Life of Britain*, by H. L. Edlin. *Lond. Nat.* **32:** 87-88.
1954. ★Birds. Mammals. *Lond. Nat.* **33:** 25.
1955. ★Birds. Mammals. *Lond. Nat.* **34:** 15-16.
——. Book review. *Walt Disney's Living Desert*, by Jane Werner. *Lond. Nat.* **34:** 160.
1956. ★Birds. Mammals (with C. P. Castell). *Lond. Nat.* **35:** 11-12.
——. ★Further observations on the bird population of an oakwood in Surrey (Eastern Wood, Bookham Common) — II. *Lond. Nat.* **35:** 21-32.
1957. *The Woodlands* chapter in *The Birds of the London Area Since 1900*, by the London Natural History Society, Collins, London. Republished in *The Birds of the London Area*, Rupert Hart-Davis, London, 1964.
——. The distribution of the grey squirrel in the London Area (1953-1956). *Lond. Nat.* **36:** 6-11.
——. ★Birds. *Lond. Nat.* **36:** 50-51.
1958. ★Mammals. Birds. *Lond. Nat.* **37:** 56-57.
——. Book review. *Man as an Animal*, by W. C. Osman Hill. *Lond. Nat.* **37:** 210.
1959. ★Birds. Mammals. *Lond. Nat.* **38:** 58-60.
——. ★The feeding sites of birds in dense oakwood, Bookham Common, Surrey. *Lond. Nat.* **38:** 64-73.
1960. ★Birds. Mammals. *Lond. Nat.* **39:** 65.
——. Anting by starlings. *Br. Birds* **53:** 24.
1961. ★Birds. Mammals. *Lond. Nat.* **40:** 71-73.
1962. ★Birds. Mammals. *Lond. Nat.* **41:** 72-74.
——. Book review. *Birds and Woods*, by W. B. Yapp. *Lond. Nat.* **41:** 93.
1963. ★Birds. Mammals. Amphibia. *Lond. Nat.* **42:** 95-97.
——. ★Some additions and amendments to the check-list of birds of Bookham Common. *Lond. Nat.* **42:** 98-100.
——. Population changes in a Surrey oakwood during fifteen years. *Br. Birds* **56:** 307-323.
——. Nest of willow tit on Bookham Common. *Lond. Bird Rep.* **26:** 113.
1964. ★Birds. Mammals. *Lond. Nat.* **43:** 84-85.

——. ★The feeding sites of birds in grassland with thick scrub. Some comparisons with dense oakwood. *Lond. Nat.* **43:** 86-109.
1965. ★Birds. Mammals. *Lond. Nat.* **44:** 112-114.
——. The food of tawny owls in London. *Lond. Bird Rep.* **29:** 56-72.
1966. ★Insects-Lepidoptera. Birds. Mammals. *Lond. Nat.* **45:** 51-55.
——. Kestrel temporarily trapped by sludge on sewage farm (letter). *Br. Birds* **59:** 45.
——. Studies of less familiar birds. 140. Black woodpecker. *Br. Birds* **59:** 233-240.
1967. ★Birds. Mammals. *Lond. Nat.* **46:** 112-116.
——. The food of tawny owls in Surrey. *Surrey Bird Rep.* **14:** 32-38.
——. Studies of less familiar birds. 143. Subalpine warbler. *Br. Birds* **60:** 123-129.
1968. ★General. Insects-Coleoptera. Freshwater invertebrates. Fish (with J. Cooper). Reptiles-grass snake. Birds. Mammals. *Lond. Nat.* **47:** 87-94.
——. ★Twenty-five years of the Bookham Common Survey, including a note on the increase of scrub on grassland. *Lond. Nat.* **47:** 95-99.
——. ★A bibliography of the natural history of Bookham Common, Surrey. *Lond. Nat.* **47:** 99-102.
——. Studies of less familiar birds. 148. Blue rock thrush. *Br. Birds* **61:** 303-307.
1969. ★General. Crustacea. Birds. Mammals. *Lond. Nat.* **48:** 126-134.
——. Bird studies on Bookham Common. *Surrey Nat.* 1969: 36-39.
——. Studies of less familiar birds. 152. Rock thrush. *Br. Birds* **62:** 23-25.
——. (With M. D. England). The impaling of prey by shrikes. *Br. Birds* **62:** 192-199.
—— – 1971. Species accounts for *Birds of the World*, I.P.C. Publications, London. Tawny owl, **4:** 1340. Black woodpecker, **5:** 1628. Rufous bush robin, **6:** 1961. Black wheatear, **6:** 2014. Blue rock thrush, **7:** 2017. Willow tit, **7:** 2289. Malachite sunbird, **8:** 2356. Brambling, **8:** 2610. Linnet, **8:** 2642. Golden oriole, **9:** 2770.
1970. ★General. Hirudinea-leeches. Insecta-Lepidoptera. Birds. *Lond. Nat.* **49:** 93-104.
——. Studies of less familiar birds. 160. Rufous bush chat. *Br. Birds* **63:** 294-299.
1971. Studies of less familiar birds. 163. Orphean warbler. *Br. Birds* **64:** 68-74.
——. Variations of bird populations in scrubland on Bookham Common, in relation to habitat changes, with special reference to conservation management. *Surrey Bird Rep.* **18:** 17-20.
——. Long-tailed tit. *World of Birds*, I.P.C. Publications, London, **1** (2).
——. Dabchick. *World of Birds* **1** (3).
——. A thirty year survey of the natural history of a Surrey common. *Ann. Rep. Norfolk Naturalist's Trust* 1971: 21-24.
1972. ★Present and future surveys. General. Lepidoptera. Birds. *Lond. Nat.* **50:** 98-108.
——. ★General. Pollution. Birds. *Lond. Nat.* **51:** 39-44.
——. Shrikes. *Encyclopaedia of the Animal World*, Elsevier Int. Prod. **18:** 1650-1652.
——. Book review. *Woodland Birds*, by Eric Simms. *Br. Birds* **65:** 175-177.
——. Dunnock feeding aphids to nestlings. *Br. Birds* **65:** 357.
——. Fantail warbler in focus. *World of Birds*, I.P.C. Publications, London, **2:** 36-41.
1973. ★General. Birds. *Lond. Nat.* **52:** 72-81.
——. Cyril Philip Castell, 1907-1972 (Obituary). *Lond. Nat.* **52:** 121-125.
——. Studies of less familiar birds. 171. Red-necked nightjar. *Br. Birds* **66:** 390-396.
——. Anonymous contributions on Bookham Common for National Trust leaflet.
1974. ★General. Birds. *Lond. Nat.* **53:** 71-78.
——. Studies of less familiar birds. 173. Icterine warbler. *Br. Birds* **67:** 370-376.
——. Book review. *Wildlife Photography. A Field Guide*, by Eric Hosking and John Gooders. *Br. Birds* **67:** 80-81.
——. A charming goldfinch, in *The Birdwatcher's Book*, ed. J. Gooders. David and Charles, Newton Abbot.
1975. ★General. Birds. Mammals. *Lond. Nat.* **54:** 38-48.
——. Great grey shrike. *World of Birds*, I.P.C. Publications, London, **3:** 10-14.
1976. ★General. Birds. Mammals. *Lond. Nat.* **55:** 19-22.
——. ★Changes in breeding bird populations of an oak-wood on Bookham Common, Surrey, over twenty-seven years. *Lond. Nat.* **55:** 23-42.
——. Fantail warbler in focus. *World of Birds*, I.P.C. Publications, London, **2:** 36-41.
——. Titmice in the garden, in *The Third Birdwatcher's Book*, ed. J. Gooders. David and Charles, Newton Abbot.
——. Simultaneous hunting by a pair of Bonelli's eagles. *Br. Birds* **69:** 410.
——. Display of lesser spotted woodpecker. *Br. Birds* **69:** 506-507.
1977. ★General. Conservation management. Insecta-Lepidoptera. Birds. Mammals. *Lond. Nat.* **56:** 71-74.
——. (With M. D. England). Studies of less familiar birds. 181. Turnstone. *Br. Birds* **70:** 23-32.

1978. ★General. Vegetation — Isle of Wight Pond (with B. R. Radcliffe). Birds. Mammals. *Lond. Nat.* **57:** 61-67.
——. Book review. *Atlas of Breeding Birds of the London Area*, ed. D. J. Montier. *Lond. Nat.* **57:** 67.
1979. Book review. *The Handbook of British Mammals*, ed. G. B. Corbet and H. N. Southern. *Lond. Nat.* **58:** 37.
——. ★General. Fish. Birds. Mammals. *Lond. Nat.* **58:** 38-43.
——. Book review. *The Mammals of the Palaearctic Region. A Taxonomic Review*, by G. B. Corbet. *Lond. Nat.* **58:** 43.
——. Griffon vulture apparently feeding on beetles. *Br. Birds* **72:** 336.
——. Little owl's method of catching cockchafers. *Br. Birds* **72:** 594-595.
1980. Hen blackbird striking human intruders in defence of nest. *Br. Birds* **73:** 35-36.
——. Coot feeding on weed disturbed by mute swans. *Br. Birds* **73:** 219-220.
——. Social pattern and behaviour of the following birds in the *Handbook of Birds of Europe, the Middle East and North Africa* **2.** Black-winged kite (with N. J. Collar): 25-26. Crane: 621-624. Demoiselle crane: 634-635. Little bustard: 641-643.
——. ★ General. Birds. Mammals. *Lond. Nat.* **59:** 60-65.
1981. ★ General. Birds. Mammals. *Lond. Nat.* **60:** 64-67.
1982. Further observations on the food of tawny owls in London. *Lond. Nat.* **61:** 88-94.
——. ★General. Butterflies. Reptiles. Birds. Mammals. *Lond. Nat.* **61:** 95-98.
1983. ★ General. Coleoptera. Amphibians and reptiles. Birds. Mammals. *Lond. Nat.* **62:** 88-96.
——. Contribution on Kittlitz's plover in the *Handbook of Birds of Europe, the Middle East and North Africa* **3:** 147-148.
1984. ★ General. Lepidoptera. Fish. Amphibians. Birds. Mammals. *Lond. Nat.* **63:** 124-131.
——. Wilfred Durant Melluish, 1899-1983 (Obituary). *Lond. Nat.* **63:** 149-150.
1985. ★General. Odonata. Lepidoptera. Amphibia. Birds. Mammals. *Lond. Nat.* **64:** 103-112.
1986. Book review. *Wildlife in Towns and Cities, Gardens, Parks and Waterways*, by M. Chinery and W. G. Teagle. *Lond. Nat.* **65:** 33.
——. Book review. *British Naturalists' Association Guide to Woodlands*, by J. L. Cloudsley-Thompson. *Lond. Nat.* **65:** 64.
——. ★General. Odonata. Coleoptera. Microlepidoptera. Fish. Amphibia. Birds. Mammals. *Lond. Nat.* **65:** 181-192.
——. Observation quoted in 'Reactions to birds in heavy rain', by R. A. Hume. *Br. Birds* **97:** 326-329.
1987. Book review. *Mammal Evolution — an Illustrated Guide*, by R. J. G. Savage and M. R. Long. *Lond. Nat.* **66:** 21.
——. Book review. *Britain's Natural Heritage. Reading Our Countryside's Past*, by P. Colebourne and B. Gibbons. *Lond. Nat.* **66:** 40.
——. Book review. Four titles by Jennifer Coldrey in the series *Animal Habitats* from Methuen Children's Books. *Lond. Nat.* **66:** 110.
——. ★General. Hirudinea. Lepidoptera. Reptilia. Birds. Mammals. *Lond. Nat.* **66:** 157-166.
1988. ★General. Hirudinea. Lepidoptera. Diptera-Syrphidae. Birds. Mammals. *Lond. Nat.* **67:** 147-156.
——. Homenaje a Antonio Cano Gea. Tres notas para un recuerdo. [Letter in Spanish from G.B. about Cano helping the English party]. *Bol. Inst. Estud. almeriensis* 1988: 23-26.
1989. ★General. Birds. Mammals. *Lond. Nat.* **68:** 133-141.
1990. ★General. Neuroptera. Lepidoptera. Amphibians. Reptiles. Birds. Mammals. *Lond. Nat.* **69:** 119-137.
——. Alan Maurice Easton, 1907-1989 (Obituary). *Lond. Nat.* **69:** 145.

London Natural History Society Income and Expenditure Account for the year ended 30 June 1989

1988 £	Income	£	£	£
	Income from members and supporters:			
6,943	Subscriptions		9,844	
60	Entrance fees		5	
241	Donations		233	
617	Tax recovered on covenanted subscriptions		580	
7,861				10,662
1,294	**Sales:** Journals	1,676		
(118)	*Less:* Expenses	(140)		
			1,536	
4	*Bulletin* subscriptions		—	
33	Literature & surplus library stock		179	
50	Journal offprints		24	
273	*Flora of the London Area*	144		
(23)	*Less:* Expenses	(8)	136	
7,063	*Butterflies of the London Area*	489		
(6,685)	*Less:* Expenses	(488)		
			1	
10	*Atlas of Breeding Birds of the London Area*		—	
1,901				1,876
	Income from investments and deposits:			
12,159	Stocks and shares		12,831	
3,549	Tax recoverable 1988/89	3,134		
789	1989/90	806		
			3,940	
76	Investment cash account		269	
24,286	Profit on sale of investments		340	
			17,380	
(2,647)	*Less.* Custodian's charges	(3,080)		
(91)	Overseas charges	(23)		
			(3,103)	
			14,277	
225	Charities Deposit Fund		112	
15	Bank deposit account		17	
38,361				14,406
48,123	**Total Income**			26,944
(27,747)	*Less* **Expenditure**			(27,871)
20,376				(927)
	Add: Writeback of provision for diminution in value of certain investments (provision created last year)	8,650		
(12,847)	*Less.* Provision for loss on stock of *Butterfly Atlas*	(7,326)		

1988 £	Expenditure	£	£
	Meeting costs, sectional & general expenditure:		
1,812	Hire of halls and rooms	1,813	
1,867	Lecturers' fees and expenses, sectional expenses etc.	1,700	
192	Postage and telephone	210	
550	Stationery	117	
938	Services (Auditors' fees, insurance, etc.)	1,206	
700	Honoraria and expense allowances	700	
110	Equipment repairs and renewals	26	
3,022	Depreciation	3,285	
9,191			9,057
	Publications		
	Printing and expenses:		
6,403	*London Naturalist* **67**	6,046	
5,551	*London Bird Report* **52**	6,135	
11,954		12,181	
960	*Programme*	1,185	
1,316	*Bulletin* and *Newsletter*	2,157	
2,099	Mailing	2,295	
16,329			17,818
754	Library		874
—	Publicity		16
	Grants, including contributions to other organisations		106
1,473			
£27,747	Total expenditure for the year		£27,871

Balance Sheet as at 30 June 1989

1988				
£	£		£	£
		Fixed Assets acquired after 30 June 1985, excluding library books.		
	10,342	Computers, including ancillary equipment and initial programming costs	10,342	
	143	Library equipment	143	
	1,627	Other indoor equipment	1,415	
	413	Bat detectors	413	
	—	Bookham hut	2,158	
	12,525		14,471	
4,783	(7,742)	*Less:* Depreciation	(11,027)	3,444
		Unsold copies of *Butterfly Atlas* at cost, including cost of complimentary		
	15,225	copies	14,928	
7,612	(7,613)	*Less:* Provision	(14,928)	
	206,558	*Quoted Investments* at cost	206,046	
	(12,847)	*Less.* Provision	(4,197)	
193,711				201,849
		(Market Value £324,926 – 1988: £284,389)		
		Current Assets		
		Funds at bank and on deposit:		
	5,016	National Westminster Bank PLC	6,030	
	2,450	Charities Deposit Fund	100	
	7,466		6,130	
	391	Cash in hand	233	
	1,414	Payments in advance and other debtors	200	
	789	Tax recoverable on investment income	2,636	
	450	Stationery stocks	375	
10,510				9,574
		Less: Current Liabilities		
	(2,647)	Custodian's charges	—	
	(25)	Contributions to bat boxes	(25)	
	(939)	General liabilities and accrued expenditure	(1,440)	
(3,611)				(1,465)
£213,005		Total net assets		£213,402
		Representing: *General Fund* (incorporating the Hindson and Castell Bequests)		
213,089		Balance at 30 June 1988		213,005
(84)		Surplus/(Deficit) for the year		397
£213,005				£213,402

C. B. ASHBY President
C. M. BALFOUR Treasurer
Dated: 29 November 1989

Report of the Auditors to the Members of the London Natural History Society

We have audited the financial statements in accordance with approved auditing standards.

In our opinion these statements give a true and fair view of the income and expenditure of the Society for the year ended 30 June 1989 and of its assets, liabilities and fund balances at that date.

4 London Wall Buildings
LONDON EC2M 5NT
29 November 1989

FRASER & RUSSELL
Chartered Accountants

Note to the Accounts

Accounting Policies

a) Subscriptions, which are collected on a calendar basis, continue to be brought in as received. No account is taken of subscriptions in arrears until received.
b) Investment Income is credited to the Income and Expenditure Account together with the income tax credit receivable.
c) Provision is made for all material debtors, prepayments, creditors and accruals with the exception of subscription income (see note a above).
d) Depreciation is provided on fixed assets at rates calculated to write off the cost of each asset over its expected useful life as follows:–
   Computer Equipment – 25%
   Other Equipment – 20%

The London Naturalist

Instructions to contributors

Submission of papers

Papers relevant to the natural history and archaeology of the London Area should be submitted to the editor, Mr K. H. Hyatt, c/o Department of Zoology, British Museum (Natural History), Cromwell Road, London SW7 5BD, before the end of January if they are to be considered for publication in the same year. They should be typed, with double spacing and wide (three cm) margins, on one side of the paper. Authors must retain a duplicate copy. Papers should include at the beginning an abstract, summary, or synopsis.

Text

Locality spellings should follow the latest editions of the maps published by the Ordnance Survey. Capitalization should be kept to a minimum. Common names of animals and plants must begin with lower-case initials, and scientific names must be underlined. When both common and Latin names are given there should be no brackets or commas separating them. Genus names should appear in full where first used within each paragraph. When scientific names are taken from a standard work, which must be cited, authorities should be omitted. In descriptive matter numbers under 10 should be in words, except in a strictly numerical context. Dates should follow the logical sequence of day, month, year (i.e. 25 December 1971). Measurements should be in metric and follow the SI system (Système International d'Unités), with imperial equivalents in parentheses where appropriate. There should be no full point following Dr, Mr, Mrs or St. Lists should be in natural, alphabetical or numerical order.

References

Reference citation should be based on the Madison rules (in *Bull. Torrey bot. Club* **22:** 130-132 (1895)), except that a colon should always precede a page number. Capitalization in titles of papers in journals should be kept to a minimum. Journal titles should follow the abbreviations in the *World List of Scientific Periodicals* and be underlined. Examples are as follows:

In text:

Meadows (1970 : 80) or (Meadows 1970).

In references:

MEADOWS, B. S. 1970. Observations on the return of fishes to a polluted tributary of the River Thames 1964-9. *Lond. Nat.* **49:** 76-81.

MELLANBY, K. 1970. *Pesticides and Pollution.* Ed. 2. Collins, London.

WHITE, K. G. 1959. Dimsdale Hall moat, part II. *Trans. a. Rep. N. Staffs. Fld Club* **92:** 39-45.

Illustrations

Distribution maps should be submitted in the form of a Recording Map with symbols in Indian ink or Letraset. Solid dots are used to indicate contemporary or recent presence, circles for old records and crosses (not pluses) for other information, such as introduced species. Tetrad dots and circles should be 4.0 mm and tetrad crosses 5.0 mm, with a line thickness of 0.8 mm; all monad symbols should be 1.6 mm with a line thickness 0.5 mm. The caption should be written outside the frame of the map and will be set up by the printer.

Line drawings should be in Indian ink on white card, larger than the printed size. Place names, etc., must be produced with stencils or Letraset. Captions should be separate as they will be set up by the printer.

Photographs should be glossy black-and-white prints, of good contrast, preferably half-plate in size, or, following consultation with the editor, in the form of colour transparencies, either 35 mm or larger.

Proofs

Proofs will be sent to authors for scrutiny, but only essential corrections can be made at that stage.

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